Adrian Scott.
Blackstone.
Mass.

April 19th. '74.

THE

DESCENT OF MAN

AND

SELECTION IN RELATION TO SEX.

BY

CHARLES DARWIN, M. A., F. R. S., Etc.

WITH ILLUSTRATIONS.

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CONTENTS.

PART II.

SEXUAL SELECTION—continued.

CHAPTER XII.

SECONDARY SEXUAL CHARACTERS OF FISHES, AMPHIBIANS, AND REPTILES.

FISHES: Courtship and Battles of the Males.—Larger Size of the Females.—Males, Bright Colors and Ornamental Appendages; other Strange Characters.—Colors and Appendages acquired by the Males during the Breeding-season alone.—Fishes with both Sexes brilliantly colored.—Protective Colors.—The less Conspicuous Colors of the Female cannot be accounted for on the Principle of Protection.—Male Fishes building Nests, and taking Charge of the Ova and Young. AMPHIBIANS: Differences in Structure and Color between the Sexes.—Vocal Organs. REPTILES: Chelonians.—Crocodiles.—Snakes, Colors in some Cases protective.—Lizards, Battles of.—Ornamental Appendages.—Strange Differences in Structure between the Sexes.—Colors.—Sexual Differences almost as great as with Birds . . . . . . p. 1

CHAPTER XIII.

SECONDARY SEXUAL CHARACTERS OF BIRDS.

Sexual Differences.—Law of Battle.—Special Weapons.—Vocal Organs.—Instrumental Music.—Love-Antics and Dances.—Decorations, Permanent and Seasonal.—Double and Single Annual Moults.—Display of Ornaments by the Males 36

CHAPTER XIV.

BIRDS—*continued.*

Choice exerted by the Female.—Length of Courtship.—Unpaired Birds.—Mental Qualities and Taste for the Beautiful.—Preference or Antipathy shown by the Female for Particular Males.— Variability of

Birds.—Variations sometimes abrupt.—Laws of Variation.—Formation of Ocelli.—Gradations of Character.—Case of Peacock, Argus Pheasant, and Urosticte . . . . p. 95

CHAPTER XV.

BIRDS—*continued.*

Discussion why the Males alone of some Species, and both Sexes of other Species, are brightly colored.—On Sexually-limited Inheritance, as applied to Various Structures and to Brightly-colored Plumage.—Nidification in Relation to Color.—Loss of Nuptial Plumage during the Winter 147

CHAPTER XVI.

BIRDS—*concluded.*

The Immature Plumage in Relation to the Character of the Plumage in both Sexes when Adult.—Six Classes of Cases.—Sexual Differences between the Males of Closely-allied or Representative Species.—The Female assuming the Characters of the Male.—Plumage of the Young in Relation to the Summer and Winter Plumage of the Adults.—On the Increase of Beauty in the Birds of the World.—Protective Coloring.—Conspicuously-colored Birds.—Novelty appreciated.—Summary of the Four Chapters on Birds 175

CHAPTER XVII.

SECONDARY SEXUAL CHARACTERS OF MAMMALS.

The Law of Battle.—Special Weapons, confined to the Males.—Cause of Absence of Weapons in the Female.—Weapons common to both Sexes, yet primarily acquired by the Male.—Other Uses of such Weapons.—Their High Importance.—Greater Size of the Male.—Means of Defence.—On the Preference shown by either Sex in the Pairing of Quadrupeds 228

CHAPTER XVIII.

SECONDARY SEXUAL CHARACTERS OF MAMMALS—*continued.*

Voice.—Remarkable Sexual Peculiarities in Seals.—Odor.—Development of the Hair.—Color of the Hair and Skin.—Anomalous Case of the Female being more ornamented than the Male.—Color and Ornaments due to Sexual Selection.—Color acquired for the Sake of Protection.—Color, though common to both Sexes, often due to Sexual Selection.—

On the Disappearance of Spots and Stripes in Adult Quadrupeds.—On the Colors and Ornaments of the Quadrumana.—Summary p. 261

CHAPTER XIX.

SECONDARY SEXUAL CHARACTERS OF MAN.

Differences between Man and Woman.—Causes of such Differences and of Certain Characters common to both Sexes.—Law of Battle.—Differences in Mental Powers—and Voice.—On the Influence of Beauty in determining the Marriages of Mankind.—Attention paid by Savages to Ornaments.—Their Ideas of Beauty in Woman.—The Tendency to exaggerate each Natural Peculiarity 301

CHAPTER XX.

SECONDARY SEXUAL CHARACTERS OF MAN—*continued.*

On the Effects of the Continued Selection of Women according to a Different Standard of Beauty in each Race.—On the Causes which interfere with Sexual Selection in Civilized and Savage Nations.—Conditions favorable to Sexual Selection during Primeval Times.—On the Manner of Action of Sexual Selection with Mankind.—On the Women in Savage Tribes having some Power to choose their Husbands.—Absence of Hair on the Body, and Development of the Beard.—Color of the Skin.—Summary 339

CHAPTER XXI.

GENERAL SUMMARY AND CONCLUSION.

Main Conclusion that Man is descended from some Lower Form.—Manner of Development.—Genealogy of Man.—Intellectual and Moral Faculties.—Sexual Selection.—Concluding Remarks . . 368

POSTSCRIPT.

Vol. I., pp. 287–289.—I have fallen into a serious and unfortunate error, in relation to the sexual differences of animals, in attempting to explain what seemed to me a singular coincidence in the late period of life at which the necessary variations have arisen in many cases, and the late period at which sexual selection acts. The explanation given is wholly erroneous, as I have discovered by working out an illustration in figures. Moreover, the supposed coincidence of period is far from general, and is not remarkable; for, as I have elsewhere attempted to show, variations arising early in life have often been accumulated through sexual selection, being then commonly transmitted to both sexes. On the other hand, variations arising late in life cannot fail to coincide approximately in period with that of the process of sexual selection.

SEXUAL SELECTION.

CHAPTER XII.

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WE have now arrived at the great sub-kingdom of the Vertebrata, and will commence with the lowest class, namely, Fishes. The males of Plagiostomous fishes (sharks, rays) and of Chimæroid fishes are provided with claspers which serve to retain the female, like the various structures possessed by so many of the lower animals. Besides the claspers, the males of many rays have clusters of strong sharp spines on their heads, and several rows along "the upper outer surface of their pectoral fins." These are present in the males of some species, which have the other parts of their bodies smooth. They are only temporarily developed during the breeding-season; and Dr. Günther suspects that they are brought into action as prehensile organs by the doubling inward and downward of the two sides of the body. It is a remarkable fact that the females and not the males of some species, as of *Raia clavata*, have their backs studded with large hook-formed spines.[1]

Owing to the element which fishes inhabit, little is known about their courtship, and not much about their battles. The male stickleback (*Gasterosteus leiurus*) has been described as "mad with delight" when the female comes out of her hiding-place and surveys the nest which he has made for her. "He darts round her in every direction, then to his accumulated materials for the nest, then back again in an instant; and as she does not advance he endeavors to push her with his snout, and then tries to pull her by the tail and side-spine to the nest."[2] The males are said to be polygamists;[3] they are extraordinarily bold and pugnacious, while "the females are quite pacific." Their battles are at times desperate; "for these puny combatants fasten tight on each other for several seconds, tumbling over and over again, until their strength appears completely exhausted." With the rough-tailed stickleback (*G. trachurus*) the males while fighting swim round and round each other, biting and endeavoring to pierce each other with their raised lateral spines. The same writer adds:[4] "The bite of these little furies is very severe. They also use their lateral spines with such fatal effect, that I have seen one during a battle absolutely rip his opponent quite open, so that he sank to the bottom and died." When a fish is conquered, "his gallant bearing forsakes him; his gay colors fade away; and he hides his disgrace among his peaceable companions, but is for some time the constant object of his conqueror's persecution."

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[1] Yarrell, 'Hist. of British Fishes,' vol. ii. 1836, pp. 417, 425, 436. Dr. Günther informs me that the spines in *R. clavata* are peculiar to the female.

[2] See Mr. R. Warington's interesting articles in 'Annals and Mag. of Nat. Hist.' Oct. 1852 and Nov. 1855.

[3] Noel Humphreys, 'River Gardens,' 1857.

[4] Loudon's 'Mag. of Natural History,' vol. iii. 1830, p. 331.

The male salmon is as pugnacious as the little stickleback; and so is the male trout, as I hear from Dr. Günther. Mr. Shaw saw a violent contest between two male salmons which lasted the whole day; and Mr. R. Buist, Superintendent of Fisheries, informs me that he has often watched from the bridge at Perth the males driving away their rivals while the females were spawning. The males "are constantly fighting and tearing each other on the spawning-beds, and many so injure each other as to cause the death of numbers, many being seen swimming near the banks of the river in a state of exhaustion, and apparently in a dying state."[5] The keeper of the Stormontfield breeding-ponds visited, as Mr. Buist informs me, in June, 1868, the northern Tyne, and found about 300 dead salmon, all of which with one exception were males; and he was convinced that they had lost their lives by fighting.

The most curious point about the male salmon is that during the breeding-season, besides a slight change in color, "the lower jaw elongates, and a cartilaginous projection turns upward from the point, which, when the jaws are closed, occupies a deep cavity between "the intermaxillary bones of the upper jaw."[6] (Figs. 26 and

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[5] 'The Field,' June 29, 1867. For Mr. Shaw's statement, see 'Edinburgh Review,' 1843. Another experienced observer (Scrope's 'Days of Salmon Fishing,' p. 60) remarks that the male would, if he could, keep, like the stag, all other males away.

[6] Yarrell, 'History of British Fishes,' vol. ii. 1836, p. 10.

27.) In our salmon this change of structure lasts only during the breeding-season; but in the *Salmo lycaodon* of Northwestern America the change, as Mr J. K. Lord[7]

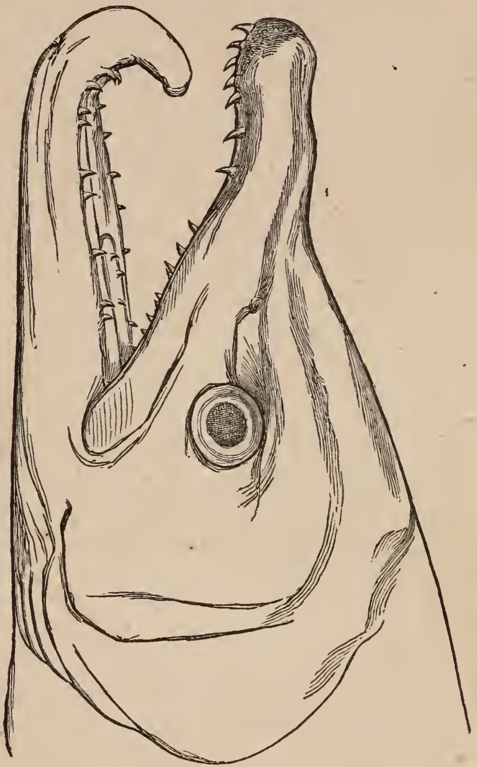

FIG. 26.—Head of male of common salmon (*Salmo salar*) during the breeding-season.

[This drawing, as well as all the others in the present chapter, have been executed by the well-known artist, Mr. G. Ford, under the kind superintendence of Dr. Günther, from specimens in the British Museum].

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[7] 'The Naturalist in Vancouver's Island,' vol. i. 1866, p. 54.

believes, is permanent and best marked in the older males which have previously ascended the rivers. In these old males the jaws become developed into immense hook-like projections, and the teeth grow into regular fangs, often more than half an inch in length. With the European salmon, according to Mr. Lloyd,[8] the temporary hook-like structure serves to strengthen and protect the jaws, when

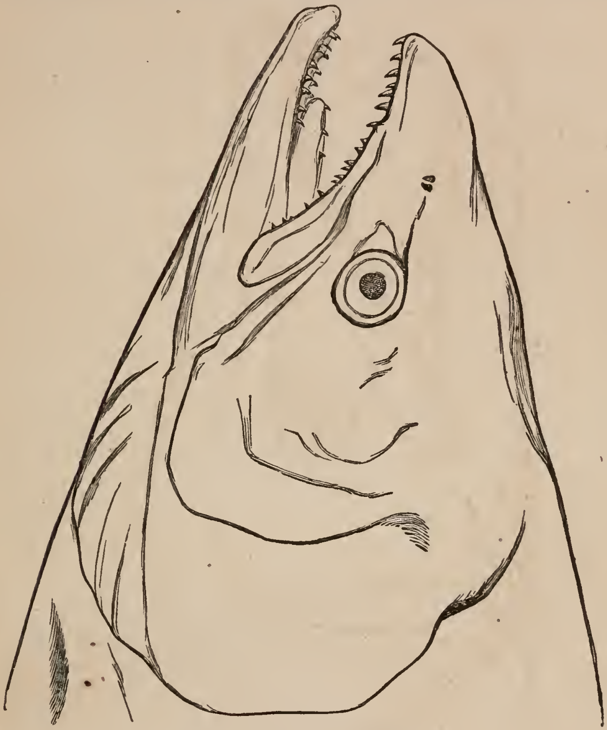

FIG. 27.—Head of female salmon.

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[8] 'Scandinavian Adventures,' vol. i. 1854, pp. 101, 104.

one male charges another with wonderful violence; but the greatly developed teeth of the male American salmon may be compared with the tusks of many male mammals, and they indicate an offensive rather than a protective purpose.

The salmon is not the only fish in which the teeth differ in the two sexes. This is the case with many rays. In the thornback (*Raia clavata*) the adult male has sharp, pointed teeth, directed backward, while those of the female are broad and flat, forming a pavement; so that these teeth differ in the two sexes of the same species more than is usual in distinct genera of the same family. The teeth of the male become sharp only when he is adult: while young they are broad and flat like those of the female. As so frequently occurs with secondary sexual characters, both sexes of some species of rays, for instance *R. batis*, possess, when adult, sharp, pointed teeth; and here a character, proper to and primarily gained by the male, appears to have been transmitted to the offspring of both sexes. The teeth are likewise pointed in both sexes of *R. maculata*, but only when completely adult; the males acquiring them at an earlier age than the females. We shall hereafter meet with analogous cases with certain birds, in which the male acquires the plumage common to both adult sexes, at a somewhat earlier age than the female. With other species of rays the males even when old never possess sharp teeth, and consequently both sexes when adult are provided with broad, flat teeth, like those of the young, and of the mature females of the above-mentioned species.[9] As the rays are bold, strong, and voracious fishes, we may suspect that the males require their sharp teeth for fighting with their rivals; but as they possess many parts modified and adapted for the prehension of the female, it is possible that their teeth may be used for this purpose.

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[9] See Yarrell's account of the Rays in his 'Hist. of British Fishes,' vol. ii. 1836, p. 416, with an excellent figure, and pp. 422, 432.

In regard to size, M. Carbonnier[10] maintains that with almost all fishes the female is larger than the male; and Dr. Günther does not know of a single instance in which the male is actually larger than the female. With some Cyprinodonts the male is not even half as large as the female. As with many kinds of fishes, the males habitually fight together; it is surprising that they have not generally become through the effects of sexual selection larger and stronger than the females. The males suffer from their small size, for according to M. Carbonnier they are liable to be devoured by the females of their own species when carnivorous, and no doubt by other species. Increased size must be in some manner of more importance to the females, than strength and size are to the males for fighting with other males; and this perhaps is to allow of the production of a vast number of ova.

In many species the male alone is ornamented with bright colors; or these are much brighter in the male than in the female. The male, also, is sometimes provided with appendages which appear to be of no more use to him for the ordinary purposes of life than are the tail-feathers to the peacock. I am indebted for most of the following facts to the great kindness of Dr. Günther. There is reason to suspect that many tropical fishes differ sexually in color and structure; and there are some striking cases with our British fishes. The male *Callionymus lyra* has been called the *gemmeous dragonet* "from its brilliant, gem-like colors." When freshly taken from the sea the body is yellow of various shades, striped and spotted with vivid blue on the head; the dorsal fins are pale brown with dark longitudinal bands; the ventral, caudal, and anal fins being bluish-black. The female, or sordid dragonet, was considered by Linnæus and by many subsequent naturalists as a distinct species; it is of a dingy reddish-brown, with the dorsal fin brown and the other fins white. The sexes differ also in the proportional size of the head and mouth, and in the position of the eyes;[11] but the most striking difference is the extraordinary elongation in the male (Fig. 28) of the dorsal fin. The young males resemble, in structure and color, the adult females. Throughout the genus Callionymus,[12] the male is gener-

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[10] As quoted in 'The Farmer,' 1868, p. 369.

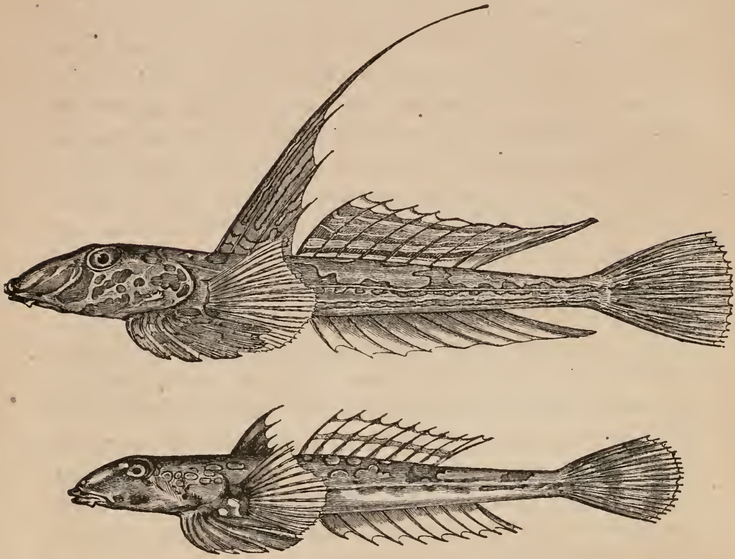

FIG. 28.—Callionymus lyra. Upper figure, male; lower figure, female.

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[11] I have drawn up this description from Yarrell's 'British Fishes,' vol. i. 1836, pp. 261, 266.

[12] 'Catalogue of Acanth. Fishes in the British Museum,' by Dr. Günther, 1861, pp. 138–151.

ally much more brightly spotted than the female, and in several species, not only the dorsal, but the anal fin of the male, is much elongated.

The male of the *Cottus scorpius*, or sea-scorpion, is more slender and smaller than the female. There is also a great difference in color between them. It is difficult, as Mr. Lloyd[13] remarks, "for any one, who has not seen this fish during the spawning-season, when its hues are brightest, to conceive the admixture of brilliant colors with which it, in other respects so ill-favored, is at that time adorned." Both sexes of the *Labrus mixtus*, although very different in color, are beautiful; the male being orange with bright-blue stripes, and the female bright-red with some black spots on the back.

In the very distinct family of the Cyprinodontidæ—inhabitants of the fresh waters of foreign lands—the sexes sometimes differ much in various characters. In the male of the *Mollienesia petenensis*,[14] the dorsal fin is greatly developed, and is marked with a row of large, round, ocellated, bright-colored spots; while the same fin in the female is smaller, of a different shape, and marked only with irregularly-curved brown spots. In the male the basal margin of the anal fin is also a little produced and dark-colored. In the male of an allied form, the *Xiphophorus Hellerii* (Fig. 29), the inferior margin of the anal fin is developed into a long filament, which is striped, as I hear from Dr. Günther, with bright colors. This filament does not contain any muscles, and apparently cannot be of any direct use to the fish. As in the case of the Callionymus, the males while young resemble in color and structure the adult females. Sexual differences such as these may be strictly compared with those which are so frequent with gallinaceous birds.[15]

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[13] 'Game Birds of Sweden,' etc., 1867, p. 466.

[14] With respect to this and the following species I am indebted to Dr. Günther for information; see also his paper on the Fishes of Central America, in 'Transact. Zoolog. Soc.' vol. vi. 1868, p. 485.

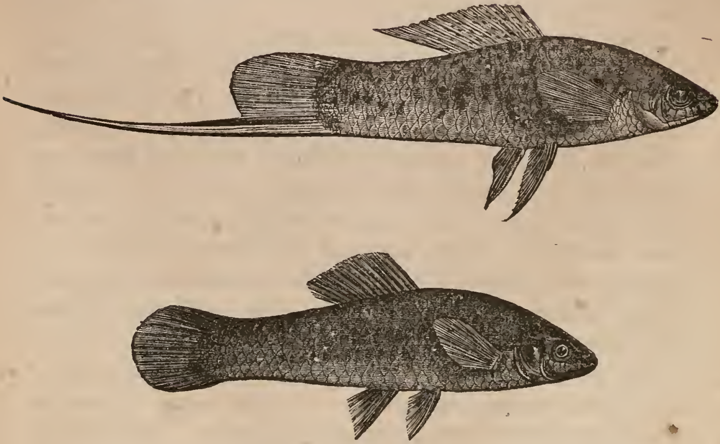

FIG. 29.—Xiphophorus Hellerii. Upper figure, male; lower figure, female.

In a siluroid fish, inhabiting the fresh waters of South America, namely the *Plecostomus barbatus*[16] (Fig. 30), the male has its mouth and interoperculum fringed with a beard of stiff hairs, of which the female shows hardly a trace. These hairs are of the nature of scales. In another species of the same genus, soft flexible tentacles project from the front part of the head of the male, which are absent in the female. These tentacles are prolongations of the true skin, and therefore are not homologous with the stiff hairs of the former species; but it can hardly be doubted that both serve the same purpose. What this purpose may be it is difficult to conjecture; ornament does not here seem probable, but we can hardly suppose

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[15] Dr. Günther makes this remark: 'Catalogue of Fishes in the British Museum,' vol. iii. 1861, p. 141.

[16] See Dr. Günther on this genus, in 'Proc. Zoolog. Soc.' 1868, p. 232.

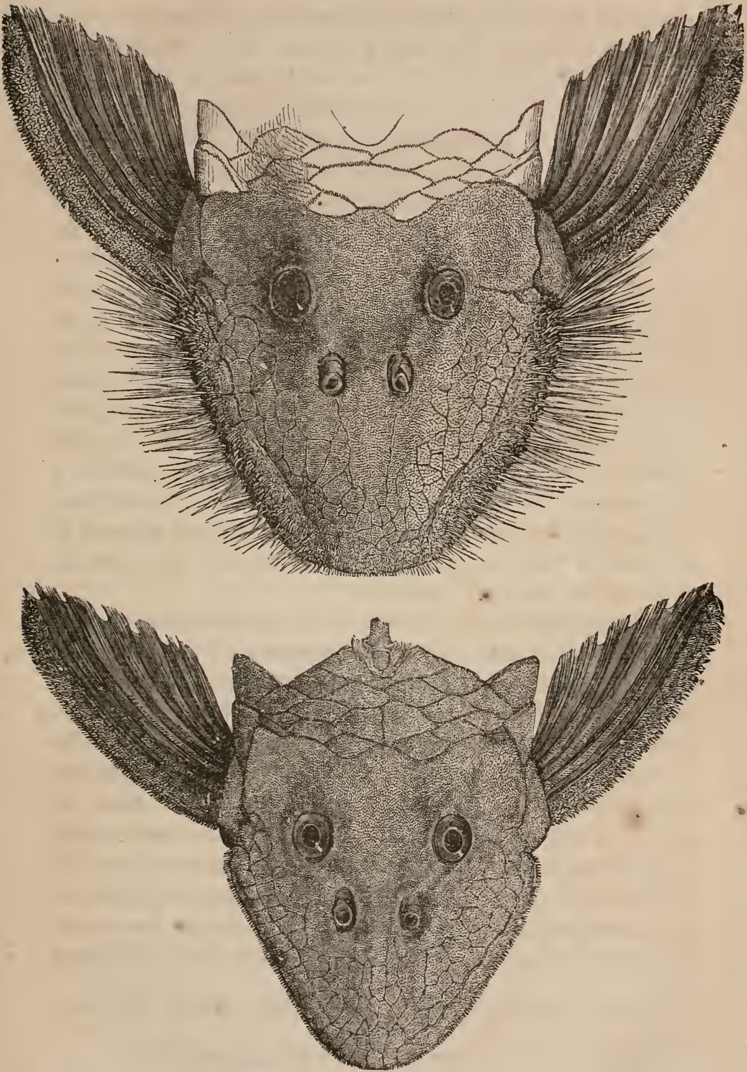

FIG. 30.—Plecostomus barbatus. Upper figure, head of male; lower figure, female.

that stiff hairs and flexible filaments can be useful in any ordinary way to the males alone. The *Monacanthus scopas*, which was shown to me in the British Museum by Dr. Günther, presents a nearly analogous case. The male has a cluster of stiff, straight spines, like those of a comb, on the sides of the tail; and these in a specimen six inches long were nearly an inch and a half in length; the female has on the same place a cluster of bristles, which may be compared with those of a tooth-brush. In another species, the *M. peronii*, the male has a brush like that possessed by the female of the last species, while the sides of the tail in the female are smooth. In some other species the same part of the tail can be perceived to be a little roughened in the male and perfectly smooth in the female; and lastly, in others, both sexes have smooth sides. In that strange monster, the *Chimæra monstrosa*, the male has a hook-shaped bone on the top of the head, directed forward, with its rounded end covered with sharp spines; in the female "this crown is altogether absent," but what its use may be is utterly unknown.[17]

The structures as yet referred to are permanent in the male after he has arrived at maturity; but with some Blennies and in another allied genus[18] a crest is developed on the head of the male only during the breeding-season, and their bodies at the same time become more brightly-colored. There can be little doubt that this crest serves as a temporary sexual ornament, for the female does not exhibit a trace of it. In other species of the same genus both sexes possess a crest, and in at least one species neither sex is thus provided. In this case and in that of the Monacanthus, we have good instances to how great an extent the sexual characters of closely-allied forms may differ. In many of the Chromidæ, for instance, in Geophagus and especially in Cichla, the males, as I hear from Prof. Agassiz,[19] have a conspicuous protuberance on the forehead, which is wholly wanting in the females and in the young males. Prof. Agassiz adds: "I have often observed these fishes at the time of spawning when the protuberance is largest, and at other seasons when it is totally wanting and the two sexes show no difference whatever in the outline of the profile of the head. I never could ascertain that it subserves any special function, and the Indians on the Amazons know nothing about its use." These protuberances in their periodical appearance resemble the fleshy caruncles on the heads of certain birds; but whether they serve as ornaments must remain at present doubtful.

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[17] F. Buckland, in 'Land and Water,' July, 1868, p. 377, with a figure.

[18] Dr. Günther, 'Catalogue of Fishes,' vol. iii. pp. 221, 240.

The males of those fishes, which differ permanently in color from the females, often become more brilliant, as I hear from Prof. Agassiz and Dr. Günther, during the breeding-season. This is likewise the case with a multitude of fishes, the sexes of which at all other seasons of the year are identical in color. The tench, roach, and perch, may be given as instances. The male salmon at this season is "marked on the cheeks with orange-colored stripes, which gave it the appearance of a Labrus, and the body partakes of a golden-orange tinge. The females are dark in color, and are commonly called blackfish."[20] An analogous and even greater change takes place with the *Salmo eriox*, or bull-trout; the males of the char (*S. umbla*) are likewise at this season rather brighter in color than the females.[21] The colors of the pike (*Esox re-*

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[19] See also 'A Journey in Brazil,' by Prof. and Mrs Agassiz, 1868, p. 220.

[20] Yarrell, 'British Fishes,' vol. ii. 1836, pp. 10, 12, 35.

[21] W. Thompson, in 'Annals and Mag. of Nat. History,' vol. vi. 1841, p. 440.

ticulatus), of the United States, especially of the male, become, during the breeding-season, exceedingly intense, brilliant, and iridescent.[22] Another striking instance out of many is afforded by the male stickleback (*Gasterosteus leiurus*), which is described by Mr. Warington,[23] as being then "beautiful beyond description." The back and eyes of the female are simply brown, and the belly white. The eyes of the male, on the other hand, are "of the most splendid green, having a metallic lustre like the green feathers of some humming-birds. The throat and belly are of a bright crimson, the back of an ashy-green, and the whole fish appears as though it were somewhat translucent, and glowed with an internal incandescence." After the breeding-season these colors all change, the throat and belly become of a paler red, the back more green, and the glowing tints subside.

That with fishes there exists some close relation between their colors and their sexual functions we can clearly see—firstly, from the adult males of certain species being differently colored from the females, and often much more brilliantly; secondly, from the same males, while immature, resembling the mature females; and, lastly, from the males, even of those species which at all other times of the year are identical in color with the females, often acquiring brilliant tints during the spawning-season. We know that the males are ardent in their courtship, and sometimes fight desperately together. If we may assume that the females have the power of exerting a choice and of selecting the more highly-ornamented males, all the above facts become intelligible through the principle of sexual selection. On the other hand, if the females habitually deposited and left their ova to be fertilized by the first male which chanced to approach, this fact would be fatal to the efficiency of sexual selection; for there could be no choice of a partner. But, as far as is known, the female never willingly spawns except in the close presence of a male, and the male never fertilizes the ova except in the close presence of a female. It is obviously difficult to obtain direct evidence with respect to female fishes selecting their partners. An excellent observer,[24] who carefully watched the spawning of minnows (*Cyprinus phoxinus*), remarks that owing to the males, which were ten times as numerous as the females, crowding closely round them, he could "speak only doubtfully on their operations. When a female came among a number of males they immediately pursued her; if she was not ready for shedding her spawn, she made a precipitate retreat; but if she was ready, she came boldly in among them, and was immediately pressed closely by a male on each side; and when they had been in that situation a short time, were superseded by other two, who wedged themselves in between them and the female, who appeared to treat all her lovers with the same kindness." Notwithstanding this last statement, I cannot, from the several previous considerations, give up the belief that the males which are the most attractive to the females, from their brighter colors or other ornaments, are commonly preferred by them; and that the males have thus been rendered more beautiful in the course of ages.

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[22] 'The American Agriculturist,' 1868, p. 100.

[23] 'Annals and Mag. of Nat. Hist.' Oct. 1852.

We have next to inquire whether this view can be extended, through the law of the equal transmission of characters to both sexes, to those groups in which the males and females are brilliant in the same or nearly the same degree and manner. In such a genus as Labrus, which includes some of the most splendid fishes in the world, for instance, the Peacock Labrus (*L. pavo*), described,[25] with pardonable exaggeration, as formed of polished scales of gold encrusting lapis-lazuli, rubies, sapphires, emeralds, and amethysts, we may, with much probability, accept this belief; for we have seen that the sexes in at least one species differ greatly in color. With some fishes, as with many of the lowest animals, splendid colors may be the direct result of the nature of their tissues, and of the surrounding conditions, without any aid from selection. The gold-fish (*Cyprinus auratus*), judging from the analogy of the golden variety of the common carp, is, perhaps, a case in point, as it may owe its splendid colors to a single abrupt variation, due to the conditions to which this fish has been subjected under confinement. It is, however, more probable that these colors have been intensified through artificial selection, as this species has been carefully bred in China from a remote period.[26] Under natural conditions it does not seem probable that beings so highly organized as fishes, and which live under such complex relations, should become brilliantly colored without suffering some evil, or receiving some benefit, from so great a change, and consequently without the intervention of natural selection.

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[24] Loudon's 'Mag. of Nat. Hist.' vol. v. 1832, p. 681.

[25] Bory de Saint-Vincent, in 'Dict. Class. d'Hist. Nat.' tom ix. 1826, p. 151.

What, then, must we conclude in regard to the many fishes, both sexes of which are splendidly colored? Mr. Wallace[27] believes that the species which frequent reefs, where corals and other brightly-colored organisms abound, are brightly colored in order to escape detection by their enemies; but according to my recollection they were thus rendered highly conspicuous. In the fresh-waters of the Tropics there are no brilliantly-colored corals or other organisms for the fishes to resemble; yet many species in the Amazons are beautifully colored, and many of the carnivorous Cyprinidæ in India are ornamented with "bright longitudinal lines of various tints."[28] Mr. McClelland, in describing these fishes goes so far as to suppose that the peculiar brilliancy of their colors" serves as "a better mark for king-fishers, terns, and other birds which are destined to keep the number of these fishes in check;" but at the present day few naturalists will admit that any animal has been made conspicuous as an aid to its own destruction. It is possible that certain fishes may have been rendered conspicuous in order to warn birds and beasts of prey (as explained when treating of caterpillars) that they were unpalatable; but it is not, I believe, known that any fish, at least any fresh-water fish, is rejected from being distasteful to fish-devouring animals. On the whole, the most probable view in regard to the fishes, of which both sexes are brilliantly colored, is that their colors have been acquired by the males as a sexual ornament, and have been transferred in an equal or nearly equal degree to the other sex.

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[26] Owing to some remarks on this subject, made in my work 'On the Variation of Animals under Domestication,' Mr. W. F. Mayers ('Chinese Notes and Queries,' Aug. 1868, p. 123) has searched the ancient Chinese encyclopædias. He finds that gold-fish were first reared in confinement during the Sung Dynasty, which commenced A. D. 960. In the year 1129 these fishes abounded. In another place it is said that since the year 1548 there has been "produced at Hang-Chow a variety called the fire-fish, from its intensely red color. It is universally admired, and there is not a household where it is not cultivated, *in rivalry as to its color*, and as a source of profit."

[27] 'Westminster Review,' July, 1867, p. 7.

We have now to consider whether, when the male differs in a marked manner from the female in color or in other ornaments, he alone has been modified, with the variations inherited only by his male offspring; or whether the female has been specially modified and rendered inconspicuous for the sake of protection, such modifications being inherited only by the females. It is impossible to doubt that color has been acquired by many fishes as a protection: no one can behold the speckled upper surface of a flounder, and overlook its resemblance to the sandy bed of the sea on which it lives. One of the most striking instances ever recorded of an animal gaining protection by its color (as far as can be judged in preserved specimens) and by its form, is that given by Dr. Günther[29] of a pipe-fish, which, with its reddish streaming filaments, is hardly distinguishable from the sea-weed to which it clings with its prehensile tail. But the question now under consideration is, whether the females alone have been modified for this object. Fishes offer valuable evidence on this head. We can see that one sex will not be modified through natural selection for the sake of protection more than the other, supposing both to vary, unless one sex is exposed for a longer period to danger, or has less power of escaping from such danger than the other sex; and it does not appear that with fishes the sexes differ in these respects. As far as there is any difference, the males, from being generally of smaller size, and from wandering more about, are exposed to greater danger than the females; and yet, when the sexes differ, the males are almost always the most conspicuously colored. The ova are fertilized immediately after being deposited, and when this process lasts for several days, as in the case of the salmon,[30] the female, during the whole time, is attended by the male. After the ova are fertilized they are, in most cases, left unprotected by both parents, so that the males and females, as far as oviposition is concerned, are equally exposed to danger, and both are equally important for the production of fertile ova; consequently the more or less brightly-colored individuals of either sex would be equally liable to be destroyed or preserved, and both would have an equal influence on the colors of their offspring or the race.

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[28] "Indian Cyprinidæ," by Mr. J. McClelland, 'Asiatic Researches,' vol. xix. part ii. 1839, p. 230.

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[29] 'Proc. Zoolog. Soc.' 1865, p. 327, pls. xiv., xv.

[30] Yarrell, 'British Fishes,' vol. ii. p. 11.

Certain fishes, belonging to several families, make nests; and some of these fishes take care of their young when hatched. Both sexes of the brightly-colored *Crenilabrus massa* and *melops* work together in building their nests with sea-weed, shells, etc.[31] But the males of certain fishes do all the work, and afterward take exclusive charge of the young. This is the case with the dull-colored gobies,[32] in which the sexes are not known to differ in color, and likewise with the sticklebacks (Gasterosteus), in which the males become brilliantly colored during the spawning-season. The male of the smooth-tailed stickleback (*G. leiurus*) performs during a long time the duties of a nurse with exemplary care and vigilance, and is continually employed in gently leading back the young to the nest when they stray too far. He courageously drives away all enemies, including the females of his own species. It would indeed be no small relief to the male if the female, after depositing her eggs, were immediately devoured by some enemy, for he is forced incessantly to drive her from the nest.[33]

The males of certain other fishes inhabiting South America and Ceylon, and belonging to two distinct orders, have the extraordinary habit of hatching the eggs laid by the females within their mouths or branchial cavities:[34] With the Amazonian species which follow this habit, the males, as I am informed by the kindness of

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[31] According to the observations of M. Gerbe; see Günther's 'Record of Zoolog. Literature,' 1865, p. 194.

[32] Cuvier, 'Règne Animal,' vol. ii. 1829, p. 242.

[33] See Mr. Warington's most interesting description of the habits of the *Gasterosteus leiurus*, in 'Annals and Mag. of Nat. Hist.' Nov. 1855.

[34] Prof. Wyman, in 'Proc. Boston Soc. of Nat. Hist.' Sept. 15, 1857. Also, W. Turner, in 'Journal of Anatomy and Phys.' Nov. 1, 1866, p. 78 Dr. Günther has likewise described other cases.

Prof. Agassiz, "not only are generally brighter than the females, but the difference is greater at the spawning-season than at any other time." The species of Geophagus act in the same manner; and in this genus, a conspicuous protuberance becomes developed on the forehead of the males during the breeding-season. With the various species of Chromids, as Prof. Agassiz likewise informs me, sexual differences in color may be observed, "whether they lay their eggs in the water among aquatic plants, or deposit them in holes, leaving them to come out without further care, or build shallow nests in the river-mud, over which they sit, as our Promotis does. It ought also to be observed that these sitters are among the brightest species in their respective families; for instance, Hygrogonus is bright green, with large black ocelli, encircled with the most brilliant red." Whether with all the species of Chromids it is the male alone which sits on the eggs is not known. It is, however, manifest that the fact of the eggs being protected or unprotected, has had little or no influence on the differences in color between the sexes. It is further manifest, in all the cases in which the males take exclusive charge of the nests and young, that the destruction of the brighter-colored males would be far more influential on the character of the race, than the destruction of the brighter-colored females; for the death of the male during the period of incubation or nursing would entail the death of the young, so that these could not inherit his peculiarities; yet, in many of these very cases the males are more conspicuously colored than the females.

In most of the Lophobranchii (Pipe-fish, Hippocampi, etc.) the males have either marsupial sacks or hemispherical depressions on the abdomen, in which the ova laid by the female are hatched. The males also show great attachment to their young.[35] The sexes do not commonly differ much in color; but Dr. Günther believes that the male Hippocampi are rather brighter than the females. The genus Solenostoma, however, offers a very curious exceptional case,[36] for the female is much more vividly colored and spotted than the male, and she alone has a marsupial sack and hatches the eggs; so that the female of Solenostoma differs from all the other Lophobranchii in this latter respect, and from almost all other fishes, in being more brightly colored than the male. It is improbable that this remarkable double inversion of character in the female should be an accidental coincidence. As the males of several fishes which take exclusive charge of the eggs and young are more brightly colored than the females, and as here the female Solenostoma takes the same charge and is brighter than the male, it might be argued that the conspicuous colors of the sex which is the most important of the two for the welfare of the offspring must serve, in some manner, as a protection. But from the multitude of fishes, the males of which are either permanently or periodically brighter than the females, but whose life is not at all more important than that of the female for the welfare of the species, this view can hardly be maintained. When we treat of birds we shall meet with analogous cases in which there has been a complete inversion of the usual attributes of the two sexes, and we shall then give what appears to be the probable explanation, namely, that the males have selected the more attractive females, instead of the latter having selected, in accordance with the usual rule throughout the animal kingdom, the more attractive males.

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[35] Yarrell, 'Hist. of British Fishes,' vol. ii. 1836, pp. 329, 338.

On the whole, we may conclude that, with most fishes, in which the sexes differ in color or in other ornamental characters, the males originally varied, with their variations transmitted to the same sex, and accumulated through sexual selection by attracting or exciting the females. In many cases, however, such characters have been transferred, either partially or completely, to the females. In other cases, again, both sexes have been colored alike for the sake of protection; but in no instance does it appear that the female alone has had her colors or other characters specially modified for this purpose.

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[36] Dr. Günther, since publishing an account of this species in 'The Fishes of Zanzibar,' by Colonel Playfair, 1866, p. 137, has reëxamined the specimens, and has given me the above information.

The last point which need be noticed is that in many parts of the world fishes are known to make peculiar noises, which are described in some cases as being musical. Very little has been ascertained with respect to the means by which such sounds are produced, and even less about their purpose. The drumming of the Umbrinas in the European seas is said to be audible from a depth of twenty fathoms. The fishermen of Rochelle assert "that the males alone make the noise during the spawning-time; and that it is possible, by imitating it, to take them without bait."[37] If this statement is trustworthy, we have an instance in this, the lowest class of the Vertebrata, of what we shall find prevailing throughout the other vertebrate classes, and which prevails, as we have already seen, with insects and spiders; namely, that vocal and instrumental sounds so commonly serve as a love-call or as a love-charm, that the power of producing them was probably first developed in connection with the propagation of the species.

AMPHIBIANS.

Urodela.—First for the tailed amphibians. The sexes of salamanders or newts often differ much both in color and structure. In some species prehensile claws are developed on the fore-legs of the males during the breeding season; and at this season in the male *Triton palmipes* the hind-feet are provided with a swimming web, which is almost completely absorbed during the winter; so that their feet then resemble those of the female.[28] This structure no doubt aids the male in his eager search and pursuit of the female. With our common newts (*Triton punctatus* and *cristatus*) a deep, much indented crest is developed along the back and tail of the male during the breeding-season, being absorbed during the winter. It is not furnished, as Mr. St. George Mivart informs me, with muscles, and therefore cannot be used for locomotion. As during the season of courtship it becomes edged with bright colors, it serves, there can hardly be a doubt, as a masculine ornament. In many species the body presents strongly-contrasted though lurid tints; and these become more vivid during the breeding-season. The male, for instance, of our common little newt (*Triton punctatus*) is "brownish gray above, passing into yellow beneath, which

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[37] The Rev. C. Kingsley, in 'Nature,' May, 1870, p. 40.

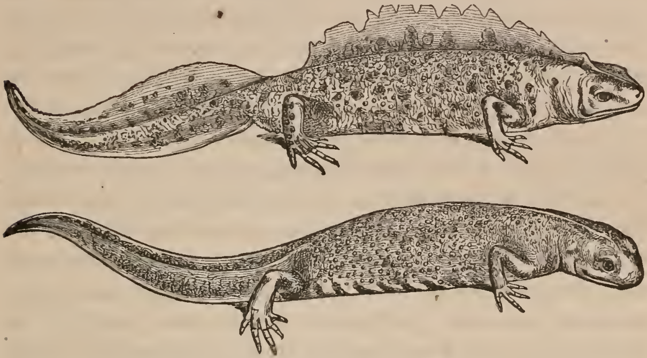

FIG. 31.—Triton cristatus (half natural size, from Bell's 'British Reptiles'). Upper figure, male during the breeding-season; lower figure, female.

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[28] Bell, "History of British Reptiles," 2d edit. 1849, pp. 156-159

in the spring becomes a rich bright orange, marked everywhere with round dark spots." The edge of the crest also is then tipped with bright red or violet. The female is usually of a yellowish-brown color with scattered brown dots; and the lower surface is often quite plain.[39] The young are obscurely tinted. The ova are fertilized during the act of deposition and are not subsequently tended by either parent. We may therefore conclude that the males acquired their strongly-marked colors and ornamental appendages through sexual selection; these being transmitted either to the male offspring alone or to both sexes.

Anura or *Batrachia.*—With many frogs and toads the colors evidently serve as a protection, such as the bright-green tints of tree-frogs and the obscure mottled shades of many terrestrial species. The most conspicuously-colored toad which I ever saw, namely, the *Phryniscus nigricans*,[40] had the whole upper surface of the body as black as ink, with the soles of the feet and parts of the abdomen spotted with the brightest vermilion. It crawled about the bare sandy or open grassy plains of La Plata under a scorching sun, and could not fail to catch the eye of every passing creature. These colors may be beneficial by making this toad known to all birds of prey as a nauseous mouthful; for it is familiar to every one that these animals emit a poisonous secretion, which causes the mouth of a dog to froth, as if attacked by hydrophobia. I was the more struck with the conspicuous colors of this toad, as close by I found a lizard (*Proctotretus multimaculatus*) which, when frightened, flattened its body, closed its eyes, and then from its mottled tints could hardly be distinguishable from the surrounding sand.

[39] Bell, ibid. pp. 146, 151.

[40] 'Zoology of the Voyage of the "Beagle,"' 1843. "Reptiles," by Mr. Bell, p. 49.

With respect to sexual differences of color, Dr. Günther knows of no striking instance with frogs or toads; yet he can often distinguish the male from the female, by the tints of the former being a little more intense. Nor does Dr. Günther know of any striking difference in external structure between the sexes, excepting the prominences which become developed during the breeding-season on the front-legs of the male, by which he is enabled to hold the female. The *Megalophrys montana*[41] (Fig. 32) offers the best case of a certain amount of structural difference between the sexes; for in the male the tip of the nose and the eyelids are produced into triangular flaps of skin, and there is a little black tubercle on the back—characters which are absent, or only feebly developed, in the females. It is surprising that frogs and toads should not have acquired more strongly-marked sexual differences; for, though cold-blooded, their passions are strong. Dr. Günther informs me that he has several times found an unfortunate female toad dead and smothered from having been so closely embraced by three or four males.

These animals, however, offer one interesting sexual difference, namely, in the musical powers possessed by the males; but to speak of music, when applied to the discordant and overwhelming sounds emitted by male bull-frogs and some other species, seems, according to our taste, a singularly inappropriate expression. Nevertheless certain frogs sing in a decidedly pleasing manner. Near Rio de Janeiro I used often to sit in the evening to listen to a number of little Hylæ, which, perched on blades of grass close to the water, sent forth sweet chirping notes in harmony. The various sounds are emitted chiefly by the males during the breeding-season, as in the case of the croaking of our common frog.[42] In accordance with this fact the vocal organs of the males are more highly developed than those of the females. In some genera the males alone are provided with sacs which open into the larynx.[43] For instance, in the edible frog (*Rana esculenta*) "the sacs are peculiar to the males, and become, when filled with air in the act of croaking, large globular bladders, standing out one on each side of the head, near the corners of the mouth." The croak of the male is thus rendered exceedingly powerful; while that of the female is only a slight groaning noise.[44] The vocal organs differ considerably in structure in the several genera of the family; and their development in all cases may be attributed to sexual selection.

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[41] 'The Reptiles of India,' by Dr. A. Günther, Ray Soc. 1864, p. 413.

[42] Bell, 'History of British Reptiles,' 1849, p. 93.

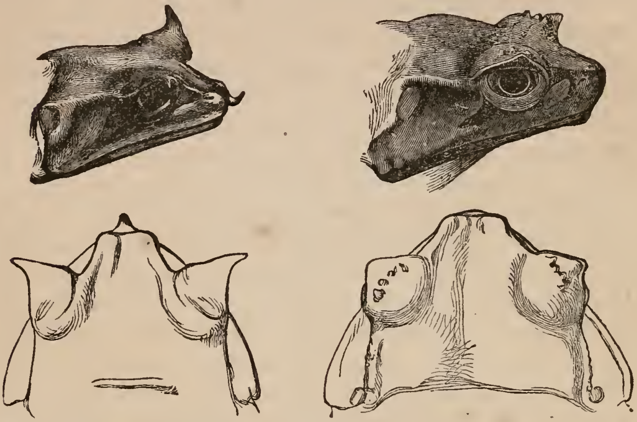

FIG. 32.—Megalophrys montana. The two left-hand figures, the male; the two right-hand figures, the female.

REPTILES.

Chelonia.—Tortoises and turtles do not offer well-marked sexual differences. In some species, the tail of the male is longer than that of the female. In some, the plastron or lower surface of the shell of the male is slightly concave in relation to the back of the female. The male of the mud-turtle of the United States (*Chrysemys picta*) has claws on its front-feet twice as long as those of the female; and these are used when the sexes unite.[45] With the huge tortoise of the Galapagos Islands (*Testudo nigra*) the males are said to grow to a larger size than the females: during the pairing-season, and at no other time, the male utters a hoarse, bellowing noise, which can be heard at the distance of more than a hundred yards; the female, on the other hand, never uses her voice.[46]

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[43] J. Bishop, in 'Todd's Cyclop. of Anat. and Phys.' vol. iv. p. 1503.

[44] Bell, ibid. pp. 112–114.

Crocodilia.—The sexes apparently do not differ in color; nor do I know that the males fight together, though this is probable, for some kinds make a prodigious display before the females. Bartram[47] describes the male alligator as striving to win the female by splashing and roaring in the midst of a lagoon, "swollen to an extent ready to burst, with his head and tail lifted up, he spins or twirls round on the surface of the water, like an Indian chief rehearsing his feats of war." During the season of love, a musky odor is emitted by the submaxillary glands of the crocodile, and pervades their haunts.[48]

Ophidia.—I have little to say about Snakes. Dr. Günther informs me that the males are always smaller than the females, and generally have longer and slenderer tails; but he knows of no other difference in external structure. In regard to color, Dr. Günther can almost always distinguish the male from the female by his more

[45] Mr. C. J. Maynard, 'The American Naturalist,' Dec. 1869, p. 555.

[46] See my 'Journal of Researches during the Voyage of the "Beagle,"' 1845, p. 384.

[47] 'Travels through Carolina,' etc., 1791, p. 128.

[48] Owen, 'Anatomy of Vertebrates,' vol. i. 1866, p. 615.

strongly-pronounced tints; thus the black zigzag band on the back of the male English viper is more distinctly defined than in the female. The difference is much plainer in the Rattlesnakes of North America, the male of which, as the keeper in the Zoological Gardens showed me, can instantly be distinguished from the female by having more lurid yellow about its whole body. In South Africa the *Bucephalus capensis* presents an analogous difference, for the female "is never so fully variegated with yellow on the sides, as the male."[49] The male of the Indian *Dipsas cynodon*, on the other hand, is blackish-brown, with the belly partly black, while the female is reddish or yellowish-olive with the belly either uniform yellowish or marbled with black. In the *Tragops dispar* of the same country, the male is bright green, and the female bronze-colored.[50] No doubt the colors of some snakes serve as a protection, as the green tints of tree-snakes and the various mottled shades of the species which live in sandy places; but it is doubtful whether the colors of many kinds, for instance of the common English snake or viper, serve to conceal them; and this is still more doubtful with the many foreign species which are colored with extreme elegance.

During the breeding-season their anal scent-glands are in active function;[51] and so it is with the same glands in lizards, and as we have seen with the submaxillary glands of crocodiles. As the males of most animals search for the females, these odoriferous glands probably serve to excite or charm the female, rather than to guide her to the spot where the male may be found.[52] Male snakes, though appearing so sluggish, are amorous; for many have been observed crowding round the same female, and even round the dead body of a female. They are not known to fight together from rivalry. Their intellectual powers are higher than might have been anticipated. An excellent observer in Ceylon, Mr. E. Layard,[53] saw a Cobra thrust its head through a narrow hole and swallow a toad. "With this encumbrance he could not withdraw himself; finding this, he reluctantly disgorged the precious morsel, which began to move off; this was too much for snake philosophy to bear, and the toad was again seized, and again was the snake, after violent efforts to escape, compelled to part with its prey. This time, however, a lesson had been learned, and the toad was seized by one leg, withdrawn, and then swallowed in triumph."

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[49] Sir Andrew Smith, 'Zoolog. of South Africa: Reptilia,' 1849, pl. x.

[50] Dr. A. Günther, 'Reptiles of British India,' Ray Soc. 1864, pp. 304, 308.

[51] Owen, 'Anatomy of Vertebrates,' vol. i. 1866, p. 615.

[52] The celebrated botanist Schleiden incidentally remarks ('Ueber den Darwinismus: Unsere Zeit,' 1869, s. 269), that Rattlesnakes use

It does not, however, follow because snakes have some reasoning power and strong passions, that they should likewise be endowed with sufficient taste to admire brilliant colors in their partners, so as to lead to the adornment of the species through sexual selection. Nevertheless, it is difficult to account in any other manner for the extreme beauty of certain species; for instance, of the coral-snakes of South America, which are of a rich red with black and yellow transverse bands. I well remember how much surprise I felt at the beauty of the first coral-snake which I saw gliding across a path in Brazil. Snakes colored in this peculiar manner, as Mr. Wallace states on the authority of Dr. Günther,[54] are found nowhere else in

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their rattles as a sexual call, by which the two sexes find each other. I do not know whether this suggestion rests on any direct observations. These snakes pair in the Zoological Gardens, but the keepers have never observed that they use their rattles at this season more than at any other.

[53] "Rambles in Ceylon," 'Annals and Mag. of Nat. Hist.' 2d series vol. ix. 1852, p. 333.

[54] 'Westminster Review,' July 1, 1867, p. 32.

the world except in South America, and here no less than four genera occur. One of these, Elaps, is venomous; a second and widely-distinct genus is doubtfully venomous, and the two others are quite harmless. The species belonging to these distinct genera inhabit the same districts, and are so like each other, that no one "but a naturalist would distinguish the harmless from the poisonous kinds." Hence, as Mr. Wallace believes, the innocuous kinds have probably acquired their colors as a protection, on the principle of imitation; for they would naturally be thought dangerous by their enemies. The cause, however, of the bright colors of the venomous Elaps remains to be explained, and this may perhaps be sexual selection.

Lacertilia.—The males of some, probably of many kinds of lizards, fight together from rivalry. Thus the arboreal *Anolis cristatellus* of South America is extremely pugnacious: "During the spring and early part of the summer, two adult males rarely meet without a contest. On first seeing one another, they nod their heads up and down three or four times, at the same time expanding the frill or pouch beneath the throat; their eyes glisten with rage, and after waving their tails from side to side for a few seconds, as if to gather energy, they dart at each other furiously, rolling over and over, and holding firmly with their teeth. The conflict generally ends in one of the combatants losing his tail, which is often devoured by the victor." The male of this species is considerably larger than the female;[55] and this, as far as Dr. Günther has been able to ascertain, is the general rule with lizards of all kinds.

The sexes often differ greatly in various external characters. The male of the above-mentioned Anolis is furnished with a crest, which runs along the back and tail, and can be erected at pleasure; but of this crest the female does not exhibit a trace. In the Indian *Cophotis ceylanica*, the female possesses a dorsal crest, though much less developed than in the male; and so it is, as Dr. Günther informs me, with the females of many Iguanas, Chameleons, and other lizards. In some species, however, the crest is equally developed in both sexes, as in the *Iguana tuberculata*. In the genus Sitana, the males alone are furnished with a large throat-pouch (Fig. 33), which can be folded up like a fan, and is colored blue, black, and red; but these splendid colors are exhibited only during the pairing-season. The female does not possess even a rudiment of this appendage. In the *Anolis cristatellus*, according to Mr. Austen, the throat-pouch, which is bright red marbled with yellow, is present, though in a rudimental condition, in the female. Again, in certain other lizards, both sexes are equally well provided with throat-pouches. Here, as in so many previous cases, we see, with species belonging to the same group, the same character confined to the males, or more largely developed in the males than in the females, or equally developed in both sexes. The little lizards of the genus Draco, which glide through the air on their rib-supported parachutes, and which in the beauty of their colors baffle description, are furnished with skinny appendages to the throat, "like the wattles of gallinaceous birds." These become erected when the animal is excited. They occur in both sexes, but are best developed in the male when ar-

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[55] Mr. N. L. Austen kept these animals alive for a considerable time; see 'Land and Water,' July, 1867, p. 9.

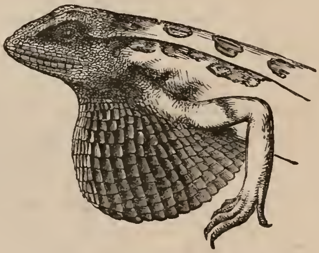

FIG. 33.—Sitana minor. Male, with the gular pouch expanded (from Günther's 'Reptiles of India').

rived at maturity, at which age the middle appendage is sometimes twice as long as the head. Most of the species likewise have a low crest running along the neck; and this is much more developed in the full-grown males than in the females or young males.[56]

There are other and much more remarkable differences between the sexes of certain lizards. The male of *Ceratophora aspera* bears on the extremity of his snout an appendage half as long as the head. It is cylindrical, covered with scales, flexible, and apparently capable of erection: in the female it is quite rudimental. In a second species of the same genus a terminal scale forms a minute horn on the summit of the flexible appendage; and in a third species (*C. Stoddartii*, Fig. 34), the whole appendage is converted into a horn, which is usually of a white color, but assumes a purplish tint when the animal is excited. In the adult male of this latter species the horn is half an inch in length, but is of quite minute size in the female and in the young. These appendages, as Dr. Günther has remarked to me, may be compared with the combs of gallinaceous birds, and apparently serve as ornaments.

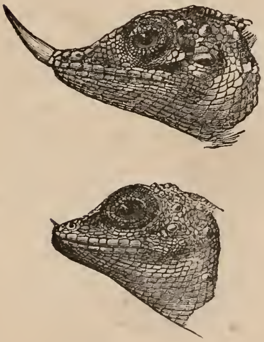

FIG. 34.—Ceratophora Stoddartii. Upper figure, male; lower figure, female.

In the genus Chamæleon we come to the climax of difference between the sexes. The upper part of the skull of the male *C. bifurcus* (Fig. 35), an inhabitant of Madagascar, is produced into two great, solid, bony projections, covered with scales like the rest of the head; and of this wonderful modification of structure the female exhibits only a rudiment. Again, in *Chamæleon Owenii* (Fig. 36), from the West Coast of Africa, the male bears on his snout and forehead three curious horns, of which the female has not a trace. These horns consist of an excrescence of bone covered with a smooth sheath, forming part of the general integuments of the body, so that they are identical in structure with those of a bull, goat, or other sheath-horned ruminant. Although the three horns

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[56] All these statements and quotations, in regard to Cophotis, Sitana, and Draco, as well as the following facts in regard to Ceratophora, are taken from Dr. Günther's magnificent work on the 'Reptiles of British India,' Ray Soc. 1864, pp. 122, 130, 135.

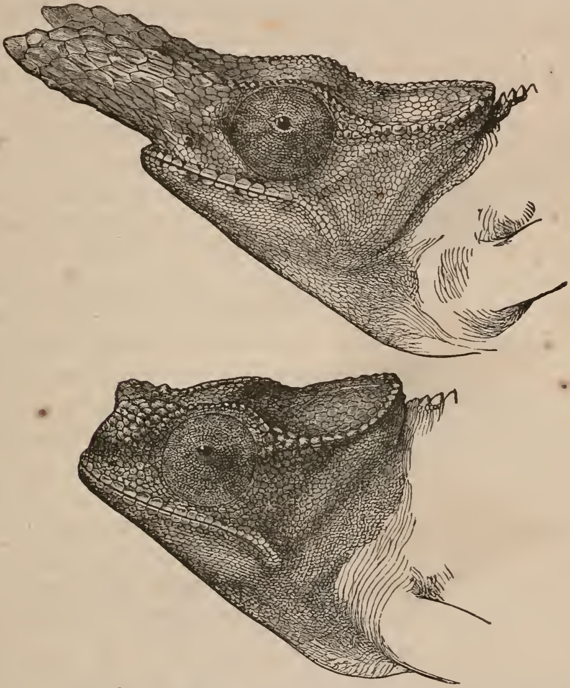

Fig. 35.—Chamæleon bifurcus. Upper figure, male; lower figure, female.

differ so much in appearance from the two great prolongations of the skull in *C. bifurcus*, we can hardly doubt that they serve the same general purpose in the economy of these two animals. The first conjecture which will occur to every one is that they are used by the males for fighting together; but Dr. Günther, to whom I am indebted for the foregoing details, does not believe that such peaceable creatures would ever become pugnacious. Hence we are driven to infer that these almost monstrous deviations of structure serve as masculine ornaments.

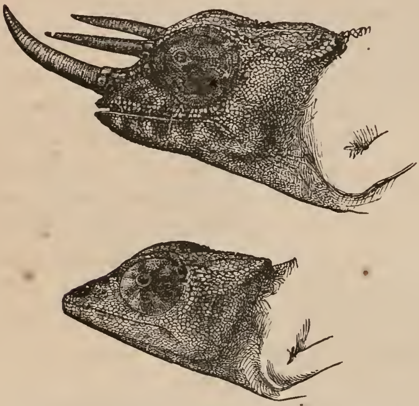

FIG. 36.—Chamæleon Owenii. Upper figure, male; lower figure, female.

With many kinds of lizards, the sexes differ slightly in color, the tints and stripes of the males being brighter and more distinctly defined than in the females. This, for instance, is the case with the previously-mentioned Cophotis and with the *Acanthodactylus capensis* of South Africa. In a Cordylus of the latter country, the male is either much redder or greener than the female. In the Indian *Calotes nigrilabris* there is a greater difference in color between the sexes; the lips also of the male are black, while those of the female are green. In our common little viviparous lizard (*Zootoca vivipara*), "the under side of the body and base of the tail in the male are bright orange, spotted with black; in the female these parts are pale grayish-green without spots."[57] We have seen that the males alone of Sitana possess a throat-pouch; and this is splendidly tinted with blue, black, and red. In the *Proctotretus tenuis* of Chili the male alone is marked with spots of blue, green, and coppery-red.[58] I collected in South America fourteen species of this genus, and though I neglected to record the sexes, I observed that certain individuals alone were marked with emerald-like green spots, while others had orange-colored gorges; and these in both cases no doubt were the males.

In the foregoing species, the males are more brightly colored than the females, but with many lizards both sexes are colored in the same elegant or even magnificent manner; and there is no reason to suppose that such conspicuous colors are protective. With some lizards, however, the green tints no doubt serve for concealment; and an instance has already been incidently given of one species of Proctotretus which closely resembles the sand on which it lives. On the whole we may conclude with tolerable safety that the beautiful colors of many lizards, as well as various appendages and other strange modifications of structure, have been gained by the males through sexual selection for the sake of ornament, and have been transmitted either to their male offspring alone or to both sexes. Sexual selection, indeed, seems to have played almost as important a part with reptiles as with birds. But the less conspicuous colors of the females in comparison with those of the males cannot be accounted for, as Mr. Wallace believes to be the case with birds, by the exposure of the females to danger during incubation.

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[57] Bell, 'History of British Reptiles,' 2d edit. 1849, p. 40.

[58] For Proctotretus see 'Zoology of the Voyage of the "Beagle:" Reptiles,' by Mr. Bell, p. 8. For the Lizards of South Africa, see 'Zoology of South Africa: Reptiles,' by Sir Andrew Smith, pls. 25, 39. For the Indian Calotes, see 'Reptiles of British India,' by Dr. Günther, p. 143.

CHAPTER XIII.

SECONDARY SEXUAL CHARACTERS OF BIRDS.

Sexual Differences.—Law of Battle.—Special Weapons.—Vocal Organs.—Instrumental Music.—Love-Antics and Dances.—Decorations, Permanent and Seasonal.—Double and Single Annual Moults.—Display of Ornaments by the Males.

SECONDARY sexual characters are more diversified and conspicuous in birds, though not perhaps entailing more important changes of structure, than in any other class of animals. I shall, therefore, treat the subject at considerable length. Male birds sometimes, though rarely, possess special weapons for fighting with each other. They charm the females by vocal or instrumental music of the most varied kinds. They are ornamented by all sorts of combs, wattles, protuberances, horns, air-distended sacs, topknots, naked shafts, plumes and lengthened feathers gracefully springing from all parts of the body. The beak and naked skin about the head and the feathers are often gorgeously colored. The males sometimes pay their court by dancing, or by fantastic antics performed either on the ground or in the air. In one instance, at least, the male emits a musky odor which we may suppose serves to charm or excite the female; for that excellent observer, Mr. Ramsay,[1] says of the Australian musk-duck (*Biziura lobata*) that "the smell which the male emits during the summer months is confined to that sex, and in some individuals is retained throughout the year; I have never, even in the breeding-season, shot a female which had any smell of musk." So powerful is this odor during the pairing-season, that it can be detected long before the bird can be seen.[2] On the whole, birds appear to be the most æsthetic of all animals, excepting of course man, and they have nearly the same taste for the beautiful as we have. This is shown by our enjoyment of the singing of birds, and by our women, both civilized and savage, decking their heads with borrowed plumes, and using gems which are hardly more brilliantly colored than the naked skin and wattles of certain birds.

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[1] 'Ibis,' vol. iii. (new series) 1867, p. 414.

Before treating of the characters with which we are here more particularly concerned, I may just allude to certain differences between the sexes which apparently depend on differences in their habits of life; for such cases, though common in the lower, are rare in the higher classes. Two humming-birds belonging to the genus Eustephanus, which inhabit the island of Juan Fernandez, were long thought to be specifically distinct, but are now known, as Mr. Gould informs me, to be the sexes of the same species, and they differ slightly in the form of the beak. In another genus of humming-birds (*Grypus*), the beak of the male is serrated along the margin and hooked at the extremity, thus differing much from that of the female. In the curious Neomorpha of New Zealand, there is a still wider difference in the form of the beak; and Mr. Gould has been informed that the male with his "straight and stout beak" tears off the bark of trees, in order that the female may feed on the uncovered larvæ with her weaker and more curved beak. Something of the same kind may be observed with our goldfinch (*Carduelis elegans*), for I am assured by Mr. J. Jenner Weir that the bird-catchers can distinguish the males by their slightly longer beaks. The flocks of males, as an old and trustworthy bird-catcher asserted, are commonly found feeding on the seeds of the teazle (Dipsacus) which they can reach with their elongated beaks, while the females more commonly feed on the seeds of the betony or Scrophularia. With a slight difference of this nature as a foundation, we can see how the beaks of the two sexes might be made to differ greatly through natural selection. In all these cases, however, especially in that of the quarrelsome humming-birds, it is possible that the differences in the beaks may have been first acquired by the males in relation to their battles, and afterward led to slightly changed habits of life.

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[2] Gould, 'Hand-book to the Birds of Australia,' 1865, vol. ii. p. 383.

Law of Battle.—Almost all male birds are extremely pugnacious, using their beaks, wings, and legs, for fighting together. We see this every spring with our robins and sparrows. The smallest of all birds, namely, the humming-bird, is one of the most quarrelsome. Mr. Gosse[3] describes a battle, in which a pair of humming-birds seized hold of each other's beaks, and whirled round and round, till they almost fell to the ground; and M. Montes de Oca, in speaking of another genus, says that two males rarely meet without a fierce aërial encounter: when kept in cages "their fighting has mostly ended in the splitting of the tongue of one of the two, which then surely dies from being unable to feed."[4] With Waders, the males of the common water-hen (*Gallinula chloropus*) "when pairing, fight violently for the females: they stand nearly upright in the water and strike with their feet." Two were seen to be thus engaged for half an hour, until one got hold of the head of the other, which would have been killed had not the observer interfered; the female all the time looking on as a quiet spectator.[5] The males of an allied bird (*Gallicrex cristatus*), as Mr. Blyth informs me, are one-third larger than the females, and are so pugnacious during the breeding-season, that they are kept by the natives of Eastern Bengal for the sake of fighting. Various other birds are kept in India for the same purpose, for instance, the Bulbuls (*Pycnonotus hæmorrhous*) which "fight with great spirit."[6]

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[3] Quoted by Mr. Gould, 'Introduction to the Trochilidæ,' 1861, p. 29.

[4] Gould, ibid. p. 52.

[5] W. Thompson, 'Nat. Hist. of Ireland: Birds,' vol. ii. 1850, p. 327.

The polygamous Ruff (*Machetes pugnax*, Fig. 37) is notorious for his extreme pugnacity; and in the spring, the males, which are considerably larger than the females, congregate day after day at a particular spot, where the females propose to lay their eggs. The fowlers discover these spots by the turf being trampled somewhat bare. Here they fight very much like game-cocks, seizing each other with their beaks and striking with their wings. The great ruff of feathers round the neck is then erected, and according to Colonel Montagu "sweeps the ground as a shield to defend the more tender parts;" and this is the only instance known to me in the case of birds, of any structure serving as a shield. The ruff of feathers, however, from its varied and rich colors probably serves in chief part as an ornament. Like most pugnacious birds, they seem always ready to fight, and when closely confined often kill each other; but Montagu observed that their pugnacity becomes greater during the spring, when the long feathers on their necks are fully developed; and at this period the least movement by any one bird provokes a general battle.[7] Of the pugnacity of web-footed birds, two instances will suffice: in Guiana "bloody fights occur during the breeding-season between the males of the wild musk-duck (*Cairina moschata*); and where these fights have occurred the river is covered for some distance with feathers."[8] Birds which seem ill-adapted for fighting engage in fierce conflicts; thus with the pelican the stronger

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[6] Jerdon, 'Birds of India,' 1863, vol. ii. p. 96

[7] Macgillivray, 'Hist. Brit. Birds,' vol. iv. 1852, pp. 177–181.

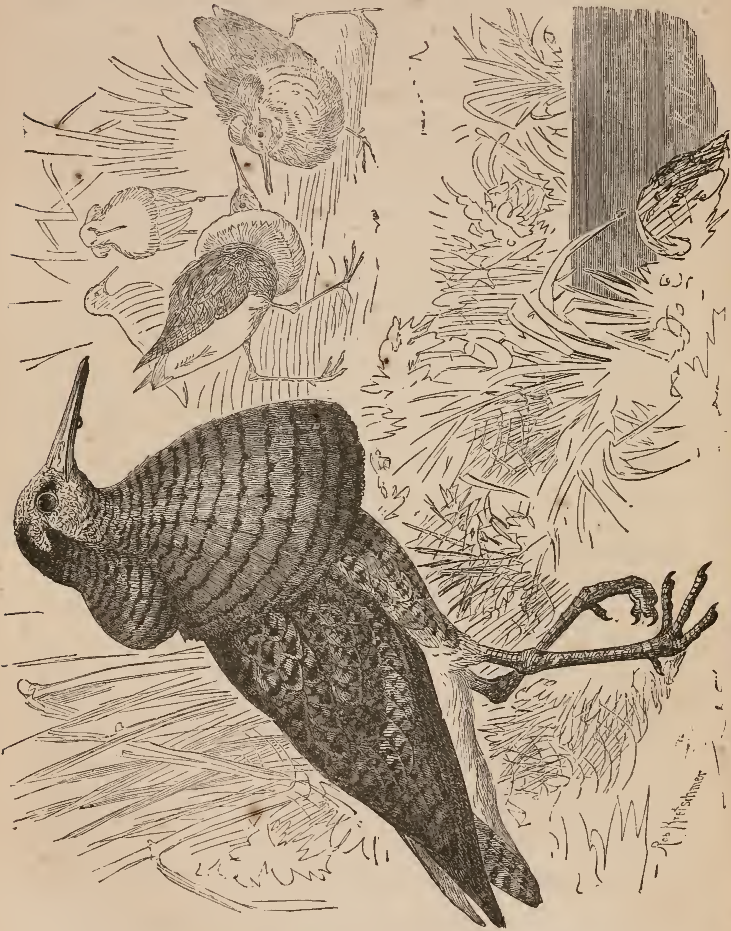

FIG 37.—The Ruff or Machetes pugnax (from Brehm's 'Thierleben').

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[8] Sir R. Schomburgk, in 'Journal of R. Geograph. Soc.' vol. xiii. 1843, p. 31.

males drive away the weaker ones, snapping with their huge beaks and giving heavy blows with their wings. Male snipes fight together, "tugging and pushing each other with their bills in the most curious manner imaginable." Some few species are believed never to fight; this is the case, according to Audubon, with one of the woodpeckers of the United States (*Picus auratus*), although "the hens are followed by even half a dozen of their gay suitors."[9]

The males of many birds are larger than the females, and this no doubt is an advantage to them in their battles with their rivals, and has been gained through sexual selection. The difference in size between the two sexes is carried to an extreme point in several Australian species; thus the male musk-duck (Biziura) and the male *Cincloramphus cruralis* (allied to our pipits) are by measurement actually twice as large as their respective females.[10] With many other birds the females are larger than the males; and as formerly remarked, the explanation often given, namely, that the females have most of the work in feeding their young, will not suffice. In some few cases, as we shall hereafter see, the females apparently have acquired their greater size and strength for the sake of conquering other females and obtaining possession of the males.

The males of many gallinaceous birds, especially of the polygamous kinds, are furnished with special weapons for fighting with their rivals, namely spurs, which can be used with fearful effect. It has been recorded by a trustworthy writer[11] that in Derbyshire a kite struck at a game-hen accompanied by her chickens, when the cock rushed to the rescue and drove his spur right through the eye and skull of the aggressor. The spur was with difficulty drawn from the skull, and as the kite though dead retained his grasp, the two birds were firmly locked together; but the cock when disentangled was very little injured. The invincible courage of the game-cock is notorious: a gentleman who long ago witnessed the following brutal scene, told me that a bird had both its legs broken by some accident in the cockpit, and the owner laid a wager that if the legs could be spliced so that the bird could stand upright, he would continue fighting. This was effected on the spot, and the bird fought with undaunted courage until he received his death-stroke. In Ceylon a closely-allied and wild species, the *Gallus Stanleyi*, is known to fight desperately "in defence of his seraglio," so that one of the combatants is frequently found dead.[12] An Indian partridge (*Ortygornis gularis*), the male of which is furnished with strong and sharp spurs, is so quarrelsome, "that the scars of former fights disfigure the breast of almost every bird you kill."[13]

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[9] 'Ornithological Biography,' vol. i. p. 191. For pelicans and snipes, see vol. iii. pp. 381, 477.

[10] Gould, 'Hand-book of Birds of Australia,' vol. i. p. 395; vol. ii. p 383.

[11] Mr. Hewitt in the 'Poultry Book by Tegetmeier,' 1866, p. 137.

The males of almost all gallinaceous birds, even those which are not furnished with spurs, engage during the breeding-season in fierce conflicts. The Capercailzie and Blackcock (*Tetrao urogallus* and *T. tetrix*), which are both polygamists, have regular appointed places, where during many weeks they congregate in numbers to fight together and to display their charms before the females. M. W. Kowalevsky informs me that in Russia he has seen the snow all bloody on the arenas where the Capercailzie have fought; and the Blackcocks "make the feathers fly in every direction," when several "engage in a battle royal." The elder Brehm gives a curious account of the

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[12] Layard, 'Annals and Mag. of Nat. Hist.' vol. xiv. 1854, p. 63

[13] Jerdon, 'Birds of India,' vol. iii. p. 574.

Balz, as the love-dance and love-song of the Blackcock is called in Germany. The bird utters almost continuously the most strange noises: "He holds his tail up and spreads it out like a fan, he lifts up his head and neck with all the feathers erect, and stretches his wings from the body. Then he takes a few jumps in different directions, sometimes in a circle, and presses the under part of his beak so hard against the ground that the chin-feathers are rubbed off. During these movements he beats his wings and turns round and round. The more ardent he grows the more lively he becomes, until at last the bird appears like a frantic creature." At such times the blackcocks are so absorbed that they become almost blind and deaf, but less so than the capercailzie: hence bird after bird may be shot on the same spot, or even caught by the hand. After performing these antics the males begin to fight: and the same blackcock, in order to prove his strength over several antagonists, will visit in the course of one morning several Balz-places, which remain the same during successive years.[14]

The peacock with his long train appears more like a dandy than a warrior, but he sometimes engages in fierce contests: the Rev. W. Darwin Fox informs me that two peacocks became so excited while fighting at some little distance from Chester, that they flew over the whole city, still fighting, until they alighted on the top of St. John's tower.

The spur, in those gallinaceous birds which are thus provided, is generally single; but Polyplectron (see Fig. 51, p. 86) has two or more on each leg; and one of the Blood pheasants (*Ithaginis cruentus*) has been seen with five spurs. The spurs are generally confined to the male, being represented by mere knobs or rudiments in the female; but the females of the Java peacock (*Pavo muticus*) and, as I am informed by Mr. Blyth, of the small fire-backed pheasant (*Euplocamus erythropthalmus*) possess spurs. In Galloperdix it is usual for the males to have two spurs, and for the females to have only one on each leg.[15] Hence spurs may safely be considered as a masculine character, though occasionally transferred in a greater or less degree to the females. Like most other secondary sexual characters, the spurs are highly variable both in number and development in the same species.

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[14] Brehm, 'Illust. Thierleben,' 1867, B. iv. s. 351. Some of the foregoing statements are taken from L. Lloyd, 'The Game-Birds of Sweden,' etc., 1867, p. 79.

Various birds have spurs on their wings. But the Egyptian goose (*Chenalopex Ægyptiacus*) has only "bare obtuse knobs," and these probably show us the first steps by which true spurs have been developed in other allied birds. In the spur-winged goose (*Plectropterus gambensis*), the males have much larger spurs than the females; and they use them, as I am informed by Mr. Bartlett, in fighting together, so that, in this case, the wing-spurs serve as sexual weapons; but according to Livingstone, they are chiefly used in the defence of the young. The Palamedea (Fig. 38) is armed with a pair of spurs on each wing; and these are such formidable weapons that a single blow has driven a dog howling away. But it does not appear that the spurs in this case, or in that of some of the spur-winged rails, are larger in the male than in the female.[16] In certain plovers, however, the wing-spurs must be considered as a sexual character. Thus in the male of our common peewit (*Vanellus cristatus*) the tubercle on the shoulder of the wing becomes more prominent during the breeding-season, and the males are known to fight together. In

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[15] Jerdon, 'Birds of India:' on Ithaginis, vol. iii. p. 523; on Galloperdix, p. 541.

[16] For the Egyptian goose, see Macgillivray, 'British Birds,' vol. iv. p. 639. For Plectropterus, 'Livingstone's Travels,' p. 254. For Palamedea, Brehm's 'Thierleben,' B. iv. s. 740. See also on this bird Azara, 'Voyages dans l'Amérique mérid.' tom. iv. 1809, pp. 179, 253.

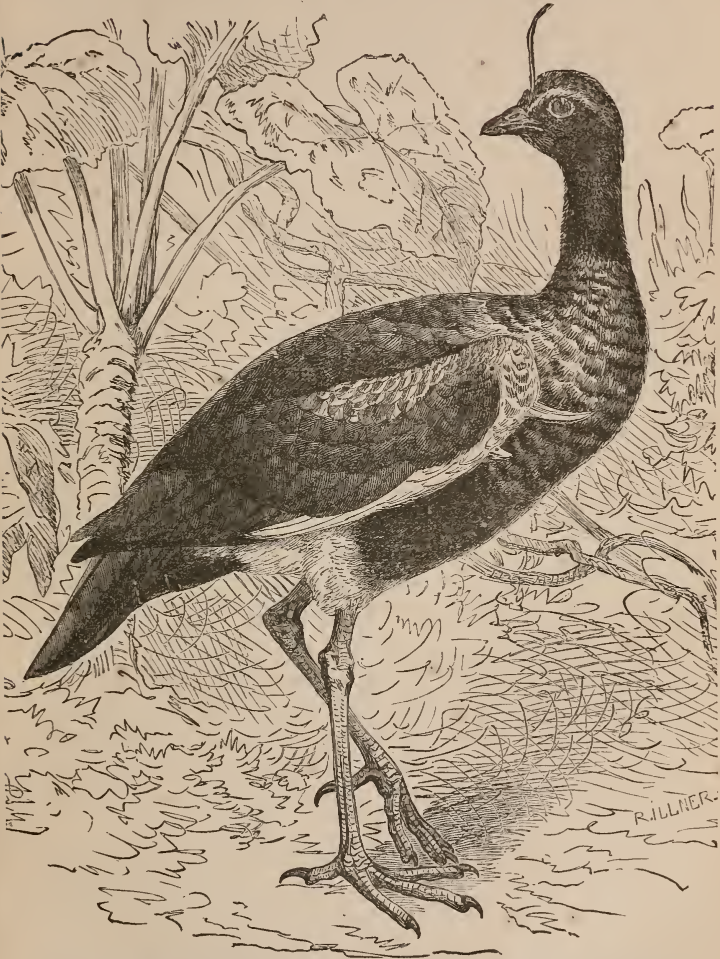

FIG. 38.—Palamedea cornuta (from Brehm), showing the double-wing-spurs, and the filament on the head.

some species of Lobivanellus a similar tubercle becomes developed during the breeding-season "into a short horny spur." In the Australian *L. lobatus* both sexes have spurs, but these are much larger in the males than in the females. In an allied bird, the *Hoplopterus armatus*, the spurs do not increase in size during the breeding-season; but these birds have been seen in Egypt to fight together, in the same manner as our peewits, by turning suddenly in the air and striking sideways at each other, sometimes with a fatal result. Thus also they drive away other enemies.[17]

The season of love is that of battle; but the males of some birds, as of the game-fowl and ruff, and even the young males of the wild-turkey and grouse,[18] are ready to fight whenever they meet. The presence of the female is the *teterrima belli causa.* The Bengali baboos make the pretty little males of the amadavat (*Estrelda amandava*) fight together by placing three small cages in a row, with a female in the middle; after a little time the two males are turned loose, and immediately a desperate battle ensues.[19] When many males congregate at the same appointed spot and fight together, as in the case of grouse and various other birds, they are generally attended by the females,[20] which afterward pair with the victorious combatants. But in some cases the pairing precedes instead of succeeding the combat: thus, according to Audubon,[21] several males of the Virginian goat-sucker (*Caprimulgus Virginianus*) "court, in a highly-entertaining manner, the female, and no sooner has she made her choice, than her approved gives chase to all intruders, and drives them beyond his dominions." Generally the males try with all their power to drive away or kill their rivals before they pair. It does not, however, appear that the females invariably prefer the victorious males. I have indeed been assured by M. W. Kowalevsky that the female capercailzie sometimes steals away with a young male who has not dared to enter the arena with the older cocks; in the same manner as occasionally happens with the does of the red-deer in Scotland. When two males contend in presence of a single female, the victor, no doubt, commonly gains his desire; but some of these battles are caused by wandering males trying to distract the peace of an already mated pair.[22]

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[17] See, on our peewit, Mr. R. Carr in 'Land and Water,' Aug. 8, 1868, p. 46. In regard to Lobivanellus, see Jerdon's 'Birds of India,' vol. iii. p. 647, and Gould's 'Hand-book of Birds of Australia,' vol. ii. p. 220. For the Hoplopterus, see Mr. Allen in the 'Ibis,' vol. v. 1863, p. 156.

[18] Audubon, 'Ornith. Biography,' vol. ii. p. 492; vol. i. pp. 4–13.

[19] Mr. Blyth, 'Land and Water,' 1867, p. 212.

[20] Richardson, on Tetrao umbellus, 'Fauna Bor. Amer.: Birds,' 1831, p. 343. L. Lloyd, 'Game-Birds of Sweden,' 1857, pp. 22, 79, on the capercailzie and blackcock. Brehm, however, asserts ('Thierleben,' etc., B. iv. s. 352) that in Germany the gray-hens do not generally attend the Balzen of the blackcocks, but this is an exception to the common rule; possibly the hens may lie hidden in the surrounding bushes, as is

Even with the most pugnacious species it is probable that the pairing does not depend exclusively on the mere strength and courage of the male: for such males are generally decorated with various ornaments, which often become more brilliant during the breeding-season, and which are sedulously displayed before the females. The males also endeavor to charm or excite their mates by love-notes, songs, and antics; and the courtship is, in many instances, a prolonged affair. Hence it is not probable that the females are indifferent to the charms of the opposite sex, or that they are invariably compelled to

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known to be the case with the gray-hens in Scandinavia, and with other species in North America.

[21] 'Ornithological Biography,' vol. ii. p. 275.

[22] Brehm, 'Thierleben,' etc., B. iv. 1867, p. 990. Audubon, 'Ornith. Biography,' vol. ii. p. 492.

yield to the victorious males. It is more probable that the females are excited, either before or after the conflict, by certain males, and thus unconsciously prefer them. In the case of *Tetrao umbellus*, a good observer[23] goes so far as to believe that the battles of the males "are all a sham, performed to show themselves to the greatest advantage before the admiring females who assemble around; for I have never been able to find a maimed hero, and seldom more than a broken feather." I shall have to recur to this subject, but I may here add that with the *Tetrao cupido* of the United States, about a score of males assemble at a particular spot, and strutting about make the whole air resound with their extraordinary noises. At the first answer from a female, the males begin to fight furiously, and the weaker give way; but then, according to Audubon, both the victors and vanquished search for the female, so that the females must either then exert a choice, or the battle must be renewed. So, again, with one of the Field-starlings of the United States (*Sturnella ludoviciana*) the males engage in fierce conflicts, "but at the sight of a female they all fly after her as if mad."[24]

Vocal and Instrumental Music.—With birds the voice serves to express various emotions, such as distress, fear, anger, triumph, or mere happiness. It is apparently sometimes used to excite terror, as with the hissing noise made by some nestling birds. Audubon[25] relates that a night-heron (*Ardea nycticorax*, Linn.), which he kept tame, used to hide itself when a cat approached. and then "suddenly start up uttering one of the most frightful cries, apparently enjoying the cat's alarm and flight." The common domestic cock clucks to the hen, and the hen to her chickens, when a dainty morsel is found. The hen, when she has laid an egg, "repeats the same note very often, and concludes with the sixth above, which she holds for a longer time;"[26] and thus she expresses her joy. Some social birds apparently call to each other for aid; and as they flit from tree to tree, the flock is kept together by chirp answering chirp. During the nocturnal migrations of geese and other water-fowl, sonorous clangs from the van may be heard in the darkness overhead, answered by clangs in the rear. Certain cries serve as danger-signals, which, as the sportsman knows to his cost, are well understood by the same species and by others. The domestic cock crows, and the humming-bird chirps, in triumph over a defeated rival. The true song, however, of most birds and various strange cries are chiefly uttered during the breeding-season, and serve as a charm, or merely as a call-note, to the other sex.

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[23] 'Land and Water,' July 25, 1868, p. 14.

[24] Audubon's 'Ornitholog. Biography;' on Tetrao cupido, vol. ii. p. 492; on the Sturnus, vol. ii. p. 219.

[25] 'Ornithological Biography,' vol. v. p. 601.

Naturalists are much divided with respect to the object of the singing of birds. Few more careful observers ever lived than Montagu, and he maintained that the "males of song-birds and of many others do not in general search for the female, but, on the contrary, their business in the spring is to perch on some conspicuous spot, breathing out their full and amorous notes, which, by instinct, the female knows, and repairs to the spot to choose her mate."[27] Mr. Jenner Weir informs me that this is certainly the case with the nightingale. Bechstein, who kept birds during his whole life, asserts that "the female canary always chooses the best singer, and that in a state of nature the female finch selects that male out of a hundred whose notes please her most."[28] There can be no doubt that birds closely attend to each other's song. Mr. Weir has told me of the case of a bullfinch which had been taught to pipe a German waltz, and who was so good a performer that he cost ten guineas; when this bird was first introduced into a room where other birds were kept and he began to sing, all the others, consisting of about twenty linnets and canaries, ranged themselves on the nearest side of their cages, and listened with the greatest interest to the new performer. Many naturalists believe that the singing of birds is almost exclusively "the effect of rivalry and emulation" and not for the sake of charming their mates. This was the opinion of Daines Barrington and White of Selborne, who both especially attended to this subject.[29] Barrington, however, admits that "superiority in song gives to birds an amazing ascendency over others, as is well known to bird-catchers."

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[26] The Hon. Daines Barrington, 'Philosoph. Transact.' 1773, p. 252.

[27] 'Ornithological Dictionary,' 1833, p. 475.

[28] 'Naturgeschichte der Stubenvögel,' 1840, s. 4. Mr. Harrison Weir

It is certain that there is an intense degree of rivalry between the males in their singing. Bird-fanciers match their birds to see which will sing longest; and I was told by Mr. Yarrell that a first-rate bird will sometimes sing till he drops down almost dead, or, according to Bechstein,[30] quite dead from rupturing a vessel in the lungs. Whatever the cause may be, male birds, as I hear from Mr. Weir, often die suddenly during the season of song. That the habit of singing is sometimes quite independent of love is clear, for a sterile hybrid canary-bird has been described[31] as singing while viewing itself in a mirror, and then dashing at its own image; it likewise attacked with fury a female canary when put into the same cage.

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likewise writes to me: "I am informed that the best singing males generally get a mate first when they are bred in the same room."

[29] 'Philosophical Transactions,' 1773, p. 263. White's 'Natural History of Selborne,' vol. i. 1825, p. 246.

[30] 'Naturges. der Stubenvögel,' 1840, s. 252.

[31] Mr. Bold, 'Zoologist,' 1843–'44, p. 659.

The jealousy excited by the act of singing is constantly taken advantage of by bird-catchers; a male, in good song, is hidden and protected, while a stuffed bird, surrounded by limed twigs, is exposed to view. In this manner a man, as Mr. Weir informs me, has caught, in the course of a single day, fifty, and in one instance seventy, male chaffinches. The power and inclination to sing differ so greatly with birds that although the price of an ordinary male chaffinch is only sixpence, Mr. Weir saw one bird for which the bird-catcher asked three pounds; the test of a really good singer being that it will continue to sing while the cage is swung round the owner's head.

That birds should sing from emulation as well as for the sake of charming the female, is not at all incompatible; and, indeed, might have been expected to go together, like decoration and pugnacity. Some authors, however, argue that the song of the male cannot serve to charm the female, because the females of some few species, such as the canary, robin, lark, and bullfinch, especially, as Bechstein remarks, when in a state of widowhood, pour forth fairly melodious strains. In some of these cases the habit of singing may be in part attributed to the females having been highly fed and confined,[32] for this disturbs all the usual functions connected with the reproduction of the species. Many instances have already been given of the partial transference of secondary masculine characters to the female, so that it is not at all surprising that the females of some species should possess the power of song. It has also been argued, that the song of the male cannot serve as a charm, because the males of certain species, for instance, of the robin, sing during the autumn.[33] But nothing is more common than for animals to take pleasure in practising whatever instinct they follow at other times for some real good. How often do we see birds which fly easily, gliding and sailing through the air obviously for pleasure! The cat plays with the captured mouse, and the cormorant with the captured fish. The weaver-bird (Ploceus), when confined in a cage, amuses itself by neatly weaving blades of grass between the wires of its cage. Birds which habitually fight during the breeding-season are generally ready to fight at all times; and the males of the capercailzie sometimes hold their *balzens* or *leks* at the usual place of assemblage during the autumn.[34] Hence it is not at all surprising that male birds should continue singing for their own amusement after the season for courtship is over.

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[32] D. Barrington, 'Phil. Transact.' 1773, p. 262. Bechstein, 'Stubenvögel,' 1840, s. 4.

[33] This is likewise the case with the water-ouzel, see Mr. Hepburn in the 'Zoologist,' 1845–1846, p. 1068.

Singing is to a certain extent, as shown in a previous chapter, an art, and is much improved by practice. Birds can be taught various tunes, and even the unmelodious sparrow has learned to sing like a linnet. They acquire the song of their foster-parents[35] and sometimes that of their neighbors.[36] All the common songsters belong to the Order of Insessores, and their vocal organs are much more complex than those of most other birds; yet it is a singular fact that some of the Insessores, such as ravens, crows, and magpies, possess the proper apparatus,[37] though they never sing and do not naturally modulate their voices to any great extent. Hunter asserts[38] that with the true songsters the muscles of the larynx are stronger in the males than in the females; but with this slight exception there is no difference in the vocal organs of the two sexes, although the males of most species sing so much better and more continuously than the females.

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[34] L. Lloyd, 'Game-Birds of Sweden,' 1867, p. 25.

[35] Barrington, ibid. p. 264. Bechstein, ibid. s. 5.

[36] Dureau de la Malle gives a curious instance ('Annales des Sc. Nat.' 3d series, Zoolog. tom. x. p. 118) of some wild blackbirds in his garden in Paris which naturally learned from a caged bird a republican air.

[37] Bishop, in 'Todd's Cyclop. of Anat. and Phys.' vol. iv. p. 1496.

[38] As stated by Barrington in 'Philosoph. Transact.' 1773, p. 262

It is remarkable that only small birds properly sing. The Australian genus Menura, however, must be excepted; for the *Menura Alberti*, which is about the size of a half-grown turkey, not only mocks other birds, but "its own whistle is exceedingly beautiful and varied." The males congregate and form "*corroborying* places," where they sing, raising and spreading their tails like peacocks and drooping their wings.[39] It is also remarkable that the birds which sing are rarely decorated with brilliant colors or other ornaments. Of our British birds, excepting the bullfinch and goldfinch, the best songsters are plain-colored. The king-fisher, bee-eater, roller, hoopee, woodpeckers, etc., utter harsh cries; and the brilliant birds of the tropics are hardly ever songsters.[40] Hence bright colors and the power of song seem to replace each other. We can perceive that if the plumage did not vary in brightness, or if bright colors were dangerous to the species, other means would have to be employed to charm the females; and the voice being rendered melodious would offer one such means.

In some birds the vocal organs differ greatly in the two sexes. In the *Tetrao cupido* (Fig. 39) the male has two bare, orange-colored sacs, one on each side of the neck; and these are largely inflated when the male, during the breeding-season, makes a curious hollow sound, audible at a great distance. Audubon proved that the sound was intimately connected with this apparatus, which reminds us of the air-sacs on each side of the mouth of certain male frogs, for he found that the sound was much diminished when one of the sacs of a tame bird was pricked, and when both were pricked it was

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[39] Gould, 'Hand-book to the Birds of Australia,' vol. i. 1865, pp. 308–310. See also Mr. T. W. Wood in the 'Student,' April, 1870, p. 125.

[40] See remarks to this effect in Gould's 'Introduction to the Trochilidæ,' 1861, p. 22.

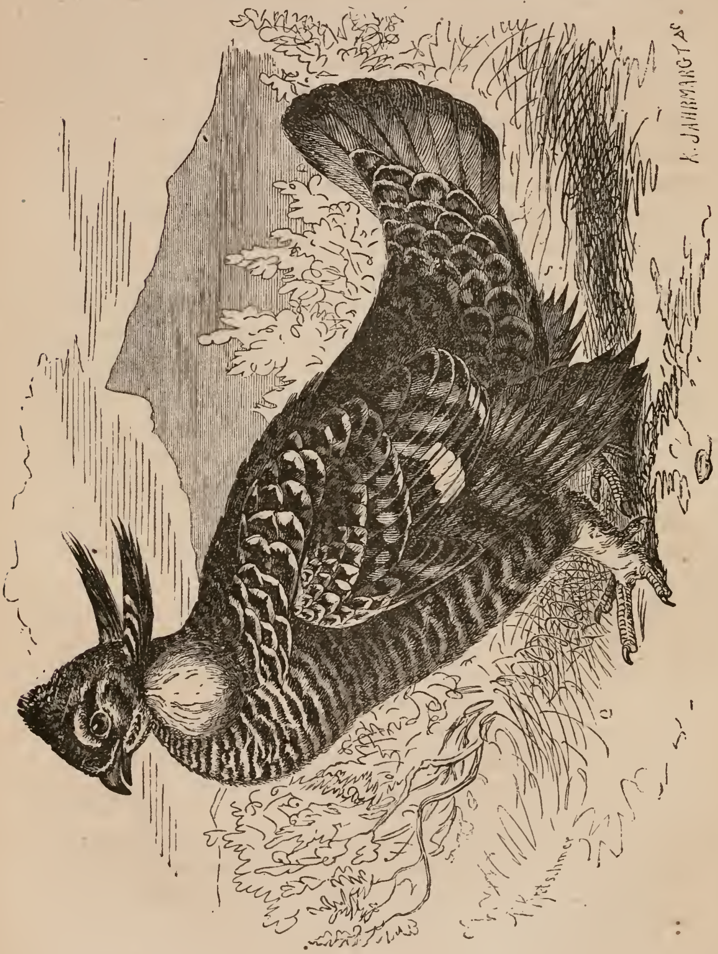
K. JAHRMARGT Sc.

Fig. 39.—Tetrao cupido: male. (From Brehm.)

altogether stopped. The female has "a somewhat similar, though smaller, naked space of skin on the neck; but this is not capable of inflation."[41] The male of another kind of grouse (*Tetrao urophasianus*), while courting the female, has his "bare yellow œsophagus inflated to a prodigious size, fully half as large as the body;" and he then utters various grating, deep hollow tones. With his neck-feathers erect, his wings lowered and buzzing on the ground, and his long pointed tail spread out like a fan, he displays a variety of grotesque attitudes. The œsophagus of the female is not in any way remarkable.[42]

It seems now well made out that the great throat-pouch of the European male bustard (*Otis tarda*), and of at least four other species, does not serve, as was formerly supposed, to hold water, but is connected with the utterance, during the breeding-season, of a peculiar sound resembling "ock." The bird while uttering this sound throws himself into the most extraordinary attitudes. It is a singular fact that, with the males of the same species, the sac is not developed in all the individuals.[43] A crow-like bird inhabiting South America (*Cephalopterus ornatus*, Fig. 40) is called the umbrella-bird, from its immense top-knot, formed of bare white quills surmounted by dark-blue plumes, which it can elevate into a great dome no less than five inches in diameter, covering the whole head. This bird has on its neck a long, thin, cylindrical, fleshy appendage, which is thickly clothed with scale-like blue feathers. It probably serves in part as an ornament, but likewise as a resounding apparatus, for Mr. Bates found that it is connected "with an unusual development of the trachea and vocal organs." It is dilated when the bird utters its singularly deep, loud, and

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[41] 'The Sportsman and Naturalist in Canada,' by Major W. Ross King, 1866, pp. 144–146. Mr. T. W. Wood gives in the 'Student' (April, 1870, p. 116) an excellent account of the attitude and habits of this bird during its courtship. He states that the ear-tufts or neck-plumes are erected, so that they meet over the crown of the head.

[42] Richardson, 'Fauna Bor. Americana: Birds,' 1831, p. 359. Audubon, ibid. vol. iv. p. 507.

[43] The following papers have been lately written on this subject: Prof. A. Newton, in the 'Ibis,' 1862, p. 107; Dr. Cullen, ibid. 1865, p. 145; Mr. Flower, in 'Proc. Zool. Soc.' 1865, p. 747; and Dr. Murie, in 'Proc. Zool. Soc.' 1868, p. 471. In this latter paper an excellent figure is given of the male Australian Bustard in full display with the sac distended.

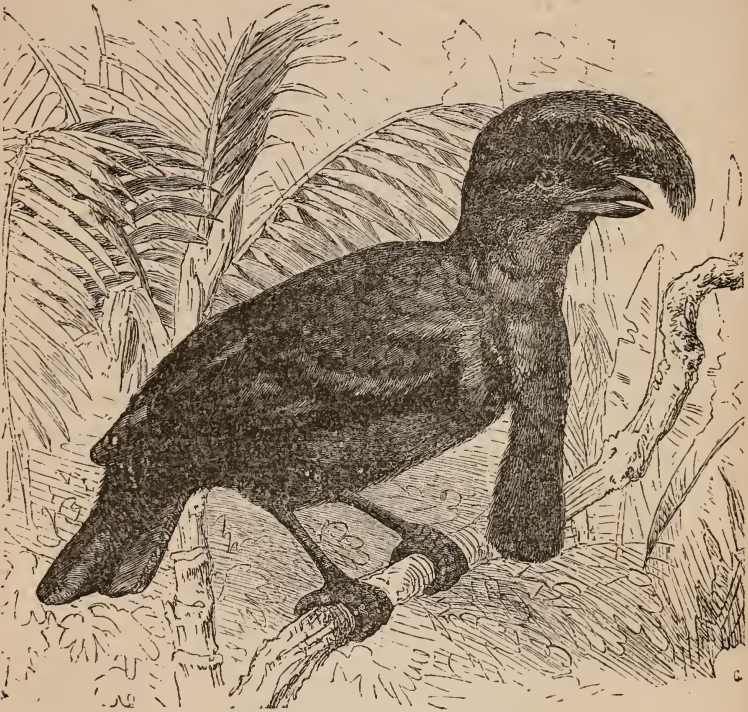

FIG. 40.—The Umbrella-Bird, or Cephalopterus ornatus (male, from Brehm).

long-sustained fluty note. The head-crest and neck-appendage are rudimentary in the female.[44]

The vocal organs of various web-footed and wading birds are extraordinarily complex, and differ to a certain extent in the two sexes. In some cases the trachea is convoluted, like a French horn, and is deeply embedded in the sternum. In the wild-swan (*Cygnus ferus*) it is more deeply embedded in the adult male than in the female or young male. In the male Merganser the enlarged portion of the trachea is furnished with an additional pair of muscles.[45] But the meaning of these differences between the sexes of many Anatidæ is not at all understood; for the male is not always the more vociferous; thus with the common duck, the male hisses, while the female utters a loud quack.[46] In both sexes of one of the cranes (*Grus virgo*) the trachea penetrates the sternum, but presents "certain sexual modifications." In the male of the black stork there is also a well-marked sexual difference in the length and curvature of the bronchi.[47] So that highly-important structures have in these cases been modified according to sex.

It is often difficult to conjecture whether the many strange cries and notes, uttered by male birds during the breeding-season, serve as a charm or merely as a call to the female. The soft cooing of the turtle-dove and of many pigeons, it may be presumed, pleases the female. When the female of the wild-turkey utters her call in the morning, the male answers by a different note from the gobbling noise which he makes, when with erected feathers, rustling wings, and distended wattles, he puffs and struts before her.[48] The *spel* of the blackcock certainly serves as a call to the female, for it has been known to bring four or five females from a distance to a male under confinement; but, as the blackcock continues his *spel* for hours during successive days, and in the case of the capercailzie "with an agony of passion," we are led to suppose that the females which are already present are thus charmed.[49] The voice of the common rook is known to alter during the breeding-season, and is therefore in some way sexual.[50] But what shall we say about the harsh screams of, for instance, some kinds of macaws; have these birds as bad taste for musical sounds as they apparently have for color, judging by the inharmonious contrast of their bright-yellow and blue plumage? It is indeed possible that the loud voices of many male birds may be the result, without any advantage being thus gained, of the inherited effects of the continued use of their vocal organs, when they are excited by the strong passions of love, jealousy, and rage; but to this point we shall recur when we treat of quadrupeds.

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[44] Bates, 'The Naturalist on the Amazons,' 1863, vol. ii. p. 284; Wallace, in 'Proc. Zool. Soc.' 1850, p. 206. A new species, with a still larger neck-appendage (*C. penduliger*), has lately been discovered, see 'Ibis,' vol. i. p. 457.

[45] Bishop, in Todd's 'Cyclop. of Anat. and Phys.' vol. iv. p. 1499.

[46] The spoonbill (Platalea) has its trachea convoluted into a figure of eight, and yet this bird (Jerdon, 'Birds of India,' vol. iii. p. 763) is mute; but Mr. Blyth informs me that the convolutions are not constantly present, so that perhaps they are now tending toward abortion.

[47] 'Elements of Comp. Anat.' by R. Wagner, Eng. translat. 1845, p. 111. With respect to the swan, as given above, Yarrell's 'Hist. of British Birds,' 2d edit. 1845, vol. iii. p. 193.

We have as yet spoken only of the voice, but the males of various birds practise, during their courtship, what may be called instrumental music. Peacocks and Birds of Paradise rattle their quills together, and the vibratory movement apparently serves merely to make a noise, for it can hardly add to the beauty of their plumage. Turkey-cocks scrape their wings against the ground, and some kinds of grouse thus produce a buzzing sound. Another North American grouse, the *Tetrao umbellus*, when with his tail erect, his ruffs displayed, "he shows off his finery to the females, who lie hid in the neighborhood," drums rapidly with his "lowered wings on the trunk of a fallen tree," or, according to Audubon, against his own body; the sound thus produced is compared by some to distant thunder, and by others to the quick roll of a drum. The female never drums, "but flies directly to the place where the male is thus engaged." In the Himalayas the male of the Kalij-pheasant "often makes a singular drumming noise with his wings, not unlike the sound produced by shaking a stiff piece of cloth." On the west coast of Africa the little black-weavers (Ploceus?) congregate in a small party on the bushes round a small open space, and sing and glide through the air with quivering wings, "which make a rapid whirring sound like a child's rattle." One bird after another thus performs for hours together, but only during the courting-season. At this same season the males of certain night-jars (Caprimulgus) make a most strange noise with their wings. The various species of woodpeckers strike a sonorous branch with their beaks, with so rapid a vibratory movement that "the head appears to be in two places at once." The sound thus produced is audible at a considerable distance, but cannot be described; and I feel sure that its cause would never be conjectured by any one who heard it for the first time. As this jarring sound is made chiefly during the breeding-season, it has been considered as a love-song; but it is perhaps more strictly a love-call. The female, when driven from her nest, has been observed thus to call her mate, who answered in the same manner and soon appeared. Lastly, the male Hoopoe (*Upupa epops*) combines vocal and instrumental music; for during the breeding-season this bird, as Mr. Swinhoe saw, first draws in air and then taps the end of its beak perpendicularly down against a stone or the trunk of a tree, "when the breath being forced down the tubular bill produces the correct sound." When the male utters its cry without striking his beak, the sound is quite different.[51]

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[48] C. L. Bonaparte, quoted in the 'Naturalist Library: Birds,' vol xiv. p. 126.

[49] L. Lloyd, 'The Game-Birds of Sweden,' etc., 1867, pp. 22, 81.

[50] Jenner, 'Philosoph. Transactions,' 1824, p. 20.

In the foregoing cases sounds are made by the aid of structures already present and otherwise necessary; but in the following cases certain feathers have been specially modified for the express purpose of producing the sounds. The drumming, or bleating, or neighing, or thundering noise, as expressed by different observers, which is made by the common snipe (*Scolopax gallinago*) must have surprised every one who has ever heard it. This bird, during the pairing-season, flies to "perhaps a thousand feet in height," and, after zigzagging about for a time, descends in a curved line, with outspread tail and quivering pinions,

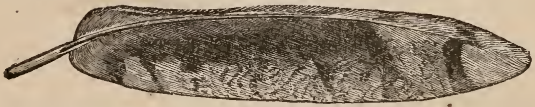

FIG. 41.—Outer tail-feather of Scolopax gallinago (from Proc. Zool. Soc. 1858).

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[51] For the foregoing several facts see, on Birds of Paradise, Brehm, 'Thierleben,' Band iii. s. 325. On Grouse, Richardson, 'Fauna Bor. Americ.: Birds,' pp. 343, 359; Major W. Ross King, 'The Sportsman in Canada,' 1866, p. 156; Audubon, 'American Ornitholog. Biograph.' vol. i. p. 216. On the Kalij-pheasant, Jerdon, 'Birds of India,' vol. iii. p. 533. On the Weavers, 'Livingstone's Expedition to the Zambesi,' 1865, p. 425. On Woodpeckers, Macgillivray, 'Hist. of British Birds,' vol. iii. 1840, pp. 84, 88, 89, 95. On the Hoopoe, Mr. Swinhoe, in 'Proc. Zoolog. Soc.' June 23, 1863. On the Night-Jar, Audubon, ibid. vol. ii. p. 255. The English Night-Jar likewise makes in the spring a curious noise during its rapid flight.

with surprising velocity to the earth. The sound is emitted only during this rapid descent. No one was able to explain the cause, until M. Meves observed that on each side of the tail the outer feathers are peculiarly formed (Fig. 41), having a stiff, sabre-shaped shaft, with the oblique barbs of unusual length, the outer webs being strongly bound together. He found that, by blowing on these feathers, or by fastening them to a long thin stick and waving them rapidly through the air, he could exactly reproduce the drumming noise made by the living bird. Both sexes are furnished with these feathers, but they are generally larger in the male than in the female, and emit a deeper note. In some species, as in *S. frenata* (Fig. 42), four feathers, and in *S. javensis* (Fig. 43), no less than eight, on each side of the tail, are greatly modified. Different tones are emitted by the feathers of the different species when waved through the air; and the *Scolopax Wilsonii* of the United States makes a switching noise while descending rapidly to the earth.[52]

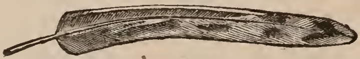

FIG. 42.—Outer tail-feather of Scolopax frenata.

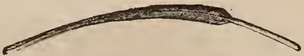

FIG. 43.—Outer tail-feather of Scolopax javensis.

In the male of the *Chamæpetes unicolor* (a large gallinaceous bird of America) the first primary wing-feather is arched toward the tip and is much more attenuated than in the female. In an allied bird, the *Penelope nigra*, Mr. Salvin observed a male, which, while it flew downward "with outstretched wings, gave forth a kind of crashing, rushing noise," like the falling of a tree.[53] The male alone of one of the Indian bustards (*Sypheotides auritus*) has its primary wing-feathers greatly acuminated; and the male of an allied species is known to make a humming noise while courting the female.[54] In a widely-different group of birds, namely the Humming-birds, the males alone of certain kinds have either the shafts of their primary wing-feathers broadly dilated, or the webs abruptly excised toward the extremity. The male, for instance, of *Selasphorus platycercus*, when adult, has the first primary wing-feather (Fig. 44) excised in this manner. While flying from flower to flower he makes "a shrill, almost whistling noise;"[55] but it did not appear to Mr. Salvin that the noise was intentionally made.

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[52] See M. Meves's interesting paper in 'Proc. Zool. Soc.' 1858, p. 199. For the habits of the snipe, Macgillivray, 'Hist. British Birds,' vol. iv. p. 371. For the American snipe, Captain Blakiston, 'Ibis,' vol. v. 1863, p. 131

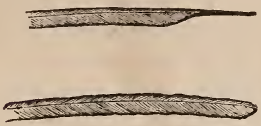

FIG. 44.—Primary wing-feather of a Humming-bird, the *Selasphorus platycercus* (from a sketch by Mr. Salvin). Upper figure, that of male; lower figure, corresponding feather of female.

Lastly, in several species of a sub-genus of Pipra or Manakin, the males have their *secondary* wing-feathers modified, as described by Mr. Sclater, in a still more remarkable manner. In the brilliantly-colored *P. deliciosa* the first three secondaries are thick-stemmed and curved toward the body; in the fourth and fifth (Fig. 45, *a*) the change is greater; and in the sixth and seventh (*b*, *c*) the shaft "is thickened to an extraordinary degree, forming a solid horny lump." The barbs also are greatly changed in shape, in comparison with the corresponding feathers

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[53] Mr. Salvin, in 'Proc. Zool. Soc.' 1867, p. 160. I am much indebted to this distinguished ornithologist for sketches of the feathers of the Chamæpetes, and for other information.

[54] Jerdon, 'Birds of India,' vol. iii. pp. 618, 621.

[55] Gould, 'Introduction to the Trochilidæ,' 1861, p. 49. Salvin, 'Proc. Zoolog. Soc.' 1867, p. 160.

(*d*, *e*, *f*) in the female. Even the bones of the wing which support these singular feathers in the male are said by Mr. Fraser to be much thickened. These little birds make an extraordinary noise, the first "sharp note being not unlike the crack of a whip."[56]

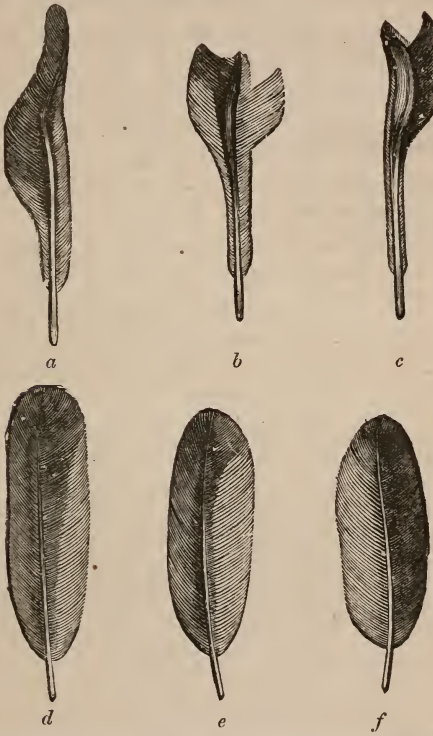

FIG. 45.—Secondary wing-feathers of *Pipra deliciosa* (from Mr. Sclater, in Proc. Zool. Soc. 1860). The three upper feathers, *a*, *b*, *c*, from the male; the three lower corresponding feathers, *d*, *e*, *f*, from the female.

a and *d*. Fifth secondary wing-feather of male and female, upper surface. *b* and *e*. Sixth secondary, upper surface. *c* and *f*. Seventh secondary, lower surface.

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[56] Sclater, in 'Proc. Zool. Soc.' 1860, p. 90, and in 'Ibis,' vol. iv. 1862, p. 175. Also Salvin, in 'Ibis,' 1860, p. 37.

The diversity of the sounds, both vocal and instrumental, made by the males of many species during the breeding-season, and the diversity of the means for producing such sounds, are highly remarkable. We thus gain a high idea of their importance for sexual purposes, and are reminded of the same conclusion with respect to insects. It is not difficult to imagine the steps by which the notes of a bird, primarily used as a mere call or for some other purpose, might have been improved into a melodious love-song. This is somewhat more difficult in the case of the modified feathers, by which the drumming, whistling, or roaring noises, are produced. But we have seen that some birds during their courtship flutter, shake, or rattle their unmodified feathers together; and, if the females were led to select the best performers, the males which possessed the strongest or thickest, or most attenuated feathers, situated on any part of the body, would be the most successful; and thus by slow degrees the feathers might be modified to almost any extent. The females, of course, would not notice each slight successive alteration in shape, but only the sounds thus produced. It is a curious fact that, in the same class of animals, sounds so different as the drumming of the snipe's tail, the tapping of the woodpecker's beak, the harsh trumpet-like cry of certain water-fowl, the cooing of the turtle-dove, and the song of the nightingale, should all be pleasing to the females of the several species. But we must not judge the tastes of distinct species by a uniform standard; nor must we judge by the standard of man's taste. Even with man, we should remember what discordant noises, the beating of tom-toms and the shrill notes of reeds, please the ears of savages. Sir S. Baker remarks,[57] that "as the stomach of the Arab prefers the raw meat and reeking liver taken hot from the animal, so does his ear prefer his equally coarse and discordant music to all other."

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[57] 'The Nile Tributaries of Abyssinia,' 1867, p. 203.

Love-Antics and Dances.—The curious love-gestures of various birds, especially of the Gallinaceæ, have already been incidentally noticed; so that little need here be added. In Northern America, large numbers of a grouse, the *Tetrao phasianellus*, meet every morning during the breeding-season on a selected level spot, and here they run round and round in a circle of about fifteen or twenty feet in diameter, so that the ground is worn quite bare, like a fairy-ring. In these Partridge-dances, as they are called by the hunters, the birds assume the strangest attitudes, and run round, some to the left and some to the right. Audubon describes the males of a heron (*Ardea herodias*) as walking about on their long legs with great dignity before the females, bidding defiance to their rivals. With one of the disgusting carrion-vultures (*Cathartes jota*) the same naturalist states that "the gesticulations and parade of the males at the beginning of the love-season are extremely ludicrous." Certain birds perform their love-antics on the wing, as we have seen with the black African weaver, instead of on the ground. During the spring our little white-throat (*Sylvia cinerea*) often rises a few feet or yards in the air above some bush, and "flutters with a fitful and fantastic motion, singing all the while, and then drops to its perch." The great English bustard throws himself into indescribably odd attitudes while courting the female, as has been figured by Wolf. An allied Indian bustard (*Otis Bengalensis*) at such times "rises perpendicularly into the air with a hurried flapping of his wings, raising his crest and puffing out the feathers of his neck and breast, and then drops to the ground;" he repeats this manœuvre several times successively, at the same time humming in a peculiar tone. Such females as happen to be near "obey this saltatory summons," and when they approach he trails his wings and spreads his tail like a turkey-cock.[58]

But the most curious case is afforded by three allied genera of Australian birds, the famous Bower-birds—no doubt the co-descendants of some ancient species which first acquired the strange instinct of constructing bowers for performing their love-antics. The bowers (Fig. 46), which, as we shall hereafter see, are highly decorated with feathers, shells, bones, and leaves, are built on the ground for the sole purpose of courtship, for their nests are formed in trees. Both sexes assist in the erection of the bowers, but the male is the principal workman. So strong is this instinct that it is practised under confinement, and Mr. Strange has described[59] the habits of some Satin Bower-birds, which he kept in his aviary in New South Wales. "At times the male will chase the female all over the aviary, then go to the bower, pick up a gay feather or a large leaf, utter a curious kind of note, set all his feathers erect, run round the bower and become so excited that his eyes appear ready to start from his head; he continues opening first one wing, and then the other, uttering a low, whistling note, and, like the domestic cock, seems to be picking up something from the ground, until at last the female goes gently toward him." Captain Stokes has described the habits and "play-houses" of another species, the Great Bower-bird, which was seen

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[58] For Tetrao phasianellus, see Richardson, 'Fauna Bor. America,' p. 361, and for further particulars Captain Blakiston, 'Ibis,' 1863, p. 125. For the Cathartes and Ardea, Audubon, 'Ornith. Biography,' vol. ii. p. 51, and vol. iii. p. 89. On the White-throat, Macgillivray, 'Hist. British Birds,' vol. ii. p. 354. On the Indian Bustard, Jerdon, 'Birds of India,' vol. iii. p. 618.

[59] Gould, 'Hand-book to the Birds of Australia,' vol. i. pp. 444, 449, 455. The bower of the Satin Bower-bird may always be seen in the Zoological Society's Gardens, Regent's Park.

"amusing itself by flying backward and forward, taking a shell alternately from each side, and carrying it through the archway in its mouth." These curious structures,

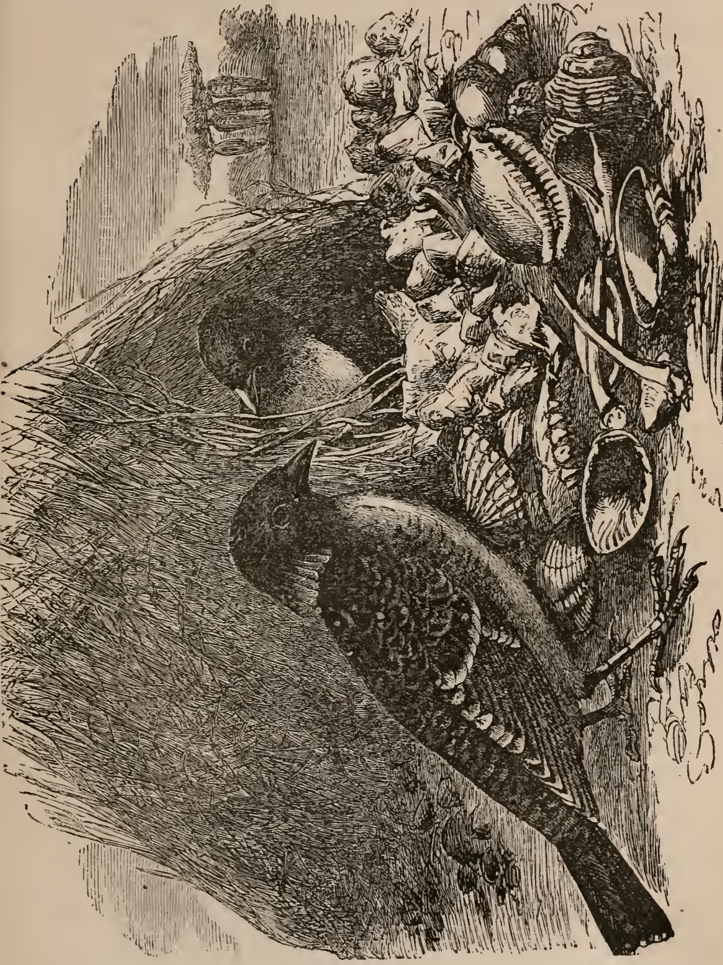

Fig. 46.—Bower-bird. Chlamydera maculata, with bower (from Brehm).

formed solely as halls of assemblages, where both sexes amuse themselves and pay their court, must cost the birds much labor. The bower, for instance, of the fawn-breasted species, is nearly four feet in length, eighteen inches in height, and is raised on a thick platform of sticks.

Decoration.—I will first discuss the cases in which the males are ornamented either exclusively or in a much higher degree than the females; and in a succeeding chapter those in which both sexes are equally ornamented, and finally the rare cases in which the female is somewhat more brightly colored than the male. As with the artificial ornaments used by savage and civilized men, so with the natural ornaments of birds, the head is the chief seat of decoration.[60] The ornaments, as mentioned at the commencement of this chapter, are wonderfully diversified. The plumes on the front or back of the head consist of variously-shaped feathers, sometimes capable of erection or expansion, by which their beautiful colors are fully displayed. Elegant ear-tufts (see Fig. 39 *ante*) are occasionally present. The head is sometimes covered with velvety down like that of the pheasant; or is naked and vividly colored; or supports fleshy appendages, filaments, and solid protuberances. The throat, also, is sometimes ornamented with a beard, or with wattles or caruncles. Such appendages are generally brightly colored, and no doubt serve as ornaments, though not always ornamental in our eyes; for while the male is in the act of courting the female, they often swell and assume more vivid tints, as in the case of the male turkey. At such times the fleshy appendages about the head of the male Tragopan pheasant (*Ceriornis temminckii*) swell into a large lappet on the throat and into two horns, one on each side of the splendid top-knot; and these are then colored of the most intense blue which I have ever beheld. The African hornbill (*Bucorax Abyssinicus*) inflates the scarlet bladder-like wattle on its neck, and with its wing drooping and tail expanded "makes quite a grand appearance."[61] Even the iris of the eye is sometimes more brightly colored in the male than in the female; and this is frequently the case with the beak, for instance, in our common blackbird. In *Buceros corrugatus*, the whole beak and immense casque are colored more conspicuously in the male than in the female; and "the oblique grooves upon the sides of the lower mandible are peculiar to the male sex."[62]

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[60] See remarks to this effect, on the "Feeling of Beauty among Animals," by Mr. J. Shaw, in the 'Athenæum,' Nov. 24, 1866, p. 681.

The males are often ornamented with elongated feathers or plumes, springing from almost every part of the body. The feathers on the throat and breast are sometimes developed into beautiful ruffs and collars. The tail-feathers are frequently increased in length, as we see in the tail-coverts of the peacock, and in the tail of the Argus pheasant. The body of this latter bird is not larger than that of a fowl; yet the length from the end of the beak to the extremity of the tail is no less than five feet three inches.[63] The wing-feathers are not elongated nearly so often as the tail-feathers; for their elongation would impede the act of flight. Yet the beautifully ocellated secondary wing-feathers of the male Argus pheasant are nearly three feet in length; and, in a small African night-jar (*Cosmetornis vexillarius*), one of the primary wing-feathers, during the breeding-season, attains a length of twenty-six inches, while the bird itself is only ten inches in length. In another closely-allied genus of night-jars,

[61] Mr. Monteiro, 'Ibis,' vol. iv. 1862, p. 339.

[62] 'Land and Water,' 1868, p. 217.

[63] Jardine's 'Naturalist Library: Birds,' vol. xiv. p. 166.

the shafts of the elongated wing-feathers are naked, except at the extremity, where there is a disk.[64] Again, in another genus of night-jars, the tail-feathers are even still more prodigiously developed; so that we see the same kind of ornament gained by the males of closely-allied birds, through the development of widely-different feathers.

It is a curious fact that the feathers of birds belonging to distinct groups have been modified in almost exactly the same peculiar manner. Thus the wing-feathers in one of the above-mentioned night-jars are bare along the shaft and terminate in a disk; or are, as they are sometimes called, spoon or racket-shaped. Feathers of this kind occur in the tail of a motmot (*Eumomota superciliaris*), of a king-fisher, finch, humming-bird, parrot, several Indian drongos (*Dicrurus* and *Edolius*, in one of which the disk stands vertically), and in the tail of certain Birds of Paradise. In these latter birds, similar feathers, beautifully ocellated, ornament the head, as is likewise the case with some gallinaceous birds. In an Indian bustard (*Sypheotides auritus*), the feathers forming the ear-tufts, which are about four inches in length, also terminate in disks.[65] The barbs of the feathers in various widely-distinct birds are filamentous or plumose, as with some Herons, Ibises, Birds of Paradise, and Gallinaceæ. In other cases the barbs disappear, leaving the shafts bare; and these in the tail of the *Paradisea apoda* attain a length of thirty-four inches.[66] Smaller feathers when thus denuded appear like bristles, as on the breast of the turkey-cock. As any fleeting fashion in dress comes to be admired by man, so with birds a change of almost any kind in the structure or coloring of the feathers, in the male, appears to have been admired by the female. The fact of the feathers in widely-distinct groups having been modified in an analogous manner, no doubt depends primarily on all the feathers having nearly the same structure and manner of development, and consequently tending to vary in the same manner. We often see a tendency to analogous variability in the plumage of our domestic breeds belonging to distinct species. Thus top-knots have appeared in several species. In an extinct variety of the turkey, the top-knot consisted of bare quills surmounted with plumes of down, so that they resembled, to a certain extent, the racket-shaped feathers above described. In certain breeds of the pigeon and fowl the feathers are plumose, with some tendency in the shafts to be naked. In the Sevastopol goose the scapular feathers are greatly elongated, curled, or even spirally twisted, with the margins plumose.[67]

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[64] Sclater, in the 'Ibis,' vol vi. 1864, p. 114. Livingstone, 'Expedition to the Zambesi,' 1865, p. 66.

[65] Jerdon, 'Birds of India,' vol. iii. p. 620.

[66] Wallace, in 'Annals and Mag. of Nat. Hist.' vol. xx. 1857, p. 416; and in his 'Malay Archipelago,' vol. ii. 1869, p. 390.

In regard to color hardly any thing need here be said; for every one knows how splendid are the tints of birds, and how harmoniously they are combined. The colors are often metallic and iridescent. Circular spots are sometimes surrounded by one or more differently-shaded zones, and are thus converted into ocelli. Nor need much be said on the wonderful differences between the sexes, or of the extreme beauty of the males of many birds. The common peacock offers a striking instance. Female Birds of Paradise are obscurely colored and destitute of all ornaments, while the males are probably the most highly decorated of all birds, and in so many ways, that they must be seen to be appreciated. The elongated and golden-orange plumes which spring from beneath the wings of the *Paradisea apoda* (see Fig. 47 of *P. rubra*, a much less beautiful species), when vertically erected and made to vibrate, are described as forming a sort of halo,

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[67] See my work on 'The Variation of Animals and Plants under Domestication,' vol. i. pp. 289, 293.

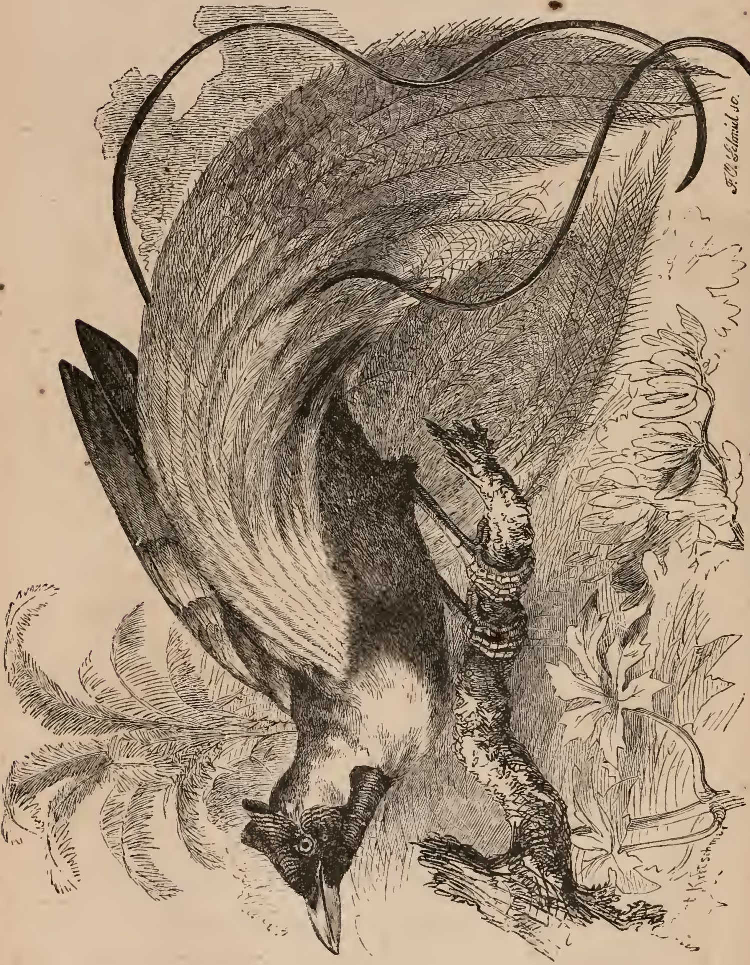

Fig. 47.—Paradisea rubra, male (from Brehm).

in the centre of which the head "looks like a little emerald sun with its rays formed by the two plumes."[68] In another most beautiful species the head is bald, "and of a

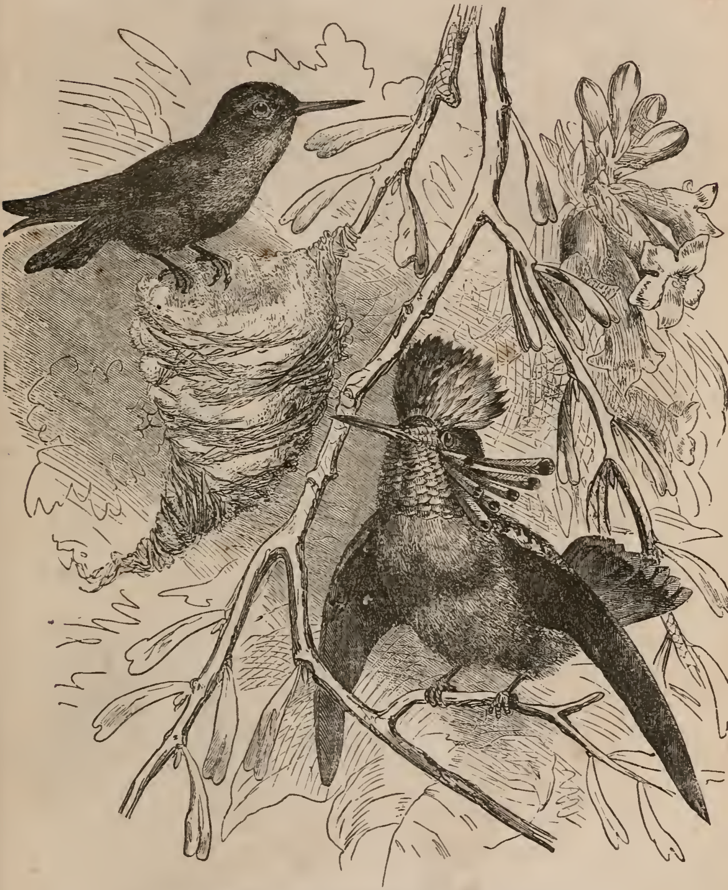

Fig. 48.—Lophornis ornatus, male and female (from Brehm).

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[68] Quoted from M. de Lafresnaye, in 'Annals and Mag. of Nat. Hist'

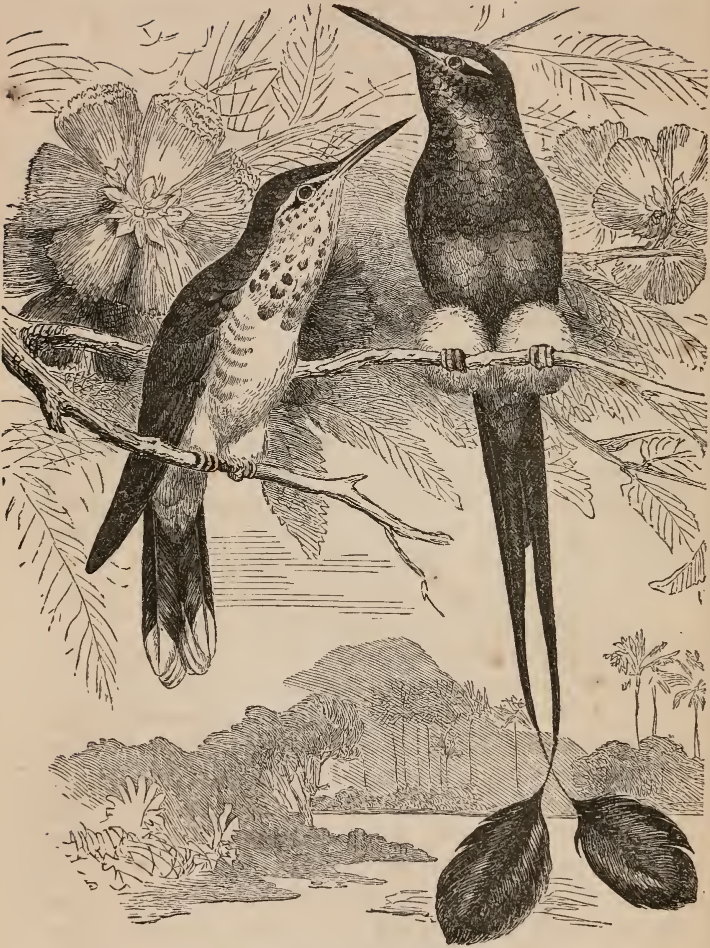

FIG. 49.—Spathura Underwoodi, male and female (from Brehm).

vol. xiii. 1854, p. 157; see also Mr. Wallace's much fuller account in vol. xx. 1857, p. 412, and in his Malay Archipelago.

rich cobalt blue, crossed by several lines of black velvety feathers."[69]

Male humming-birds (Figs. 48 and 49) almost vie with Birds of Paradise in their beauty, as every one will admit who has seen Mr. Gould's splendid volumes or his rich collection. It is very remarkable in how many different ways these birds are ornamented. Almost every part of the plumage has been taken advantage of and modified; and the modifications have been carried, as Mr. Gould showed me, to a wonderful extreme in some species belonging to nearly every sub-group. Such cases are curiously like those which we see in our fancy breeds, reared by man for the sake of ornament: certain individuals originally varied in one character, and other individuals belonging to the same species in other characters; and these have been seized on by man and augmented to an extreme point—as the tail of the fantail-pigeon, the hood of the jacobin, the beak and wattle of the carrier, etc. The sole difference between these cases is that in the one the result is due to man's selection, while in the other, as with Humming-birds, Birds of Paradise, etc., it is due to sexual selection—that is, to the selection by the females of the more beautiful males.

I will mention only one other bird, remarkable from the extreme contrast in color between the sexes, namely, the famous Bell-bird (*Chasmorhynchus niveus*) of South America, the note of which can be distinguished at the distance of nearly three miles, and astonishes every one who first hears it. The male is pure white, while the female is dusky-green; and the former color with terrestrial species of moderate size and inoffensive habits is very rare. The male, also, as described by Waterton, has a spiral tube, nearly three inches in length, which rises from the base of the beak. It is jet-black, dotted over with minute downy feathers. This tube can be inflated with air, through a communication with the palate; and when not inflated hangs down on one side. The genus consists of four species, the males of which are very distinct, while the females, as described by Mr. Sclater in a most interesting paper, closely resemble each other, thus offering an excellent instance of the common rule that within the same group the males differ much more from each other than do the females. In a second species (*C. nudicollis*) the male is likewise snow-white, with the exception of a large space of naked skin on the throat and round the eyes, which during the breeding-season is of a fine green color. In a third species (*C. tricarunculatus*) the head and neck alone of the male are white, the rest of the body being chestnut-brown, and the male of this species is provided with three filamentous projections half as long as the body—one rising from the base of the beak and the two others from the corners of the mouth.[70]

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[69] Wallace, 'The Malay Archipelago,' vol. ii. 1869, p. 405.

The colored plumage and certain other ornaments of the males when adult are either retained for life or are periodically renewed during the summer and breeding-season. At this season the beak and naked skin about the head frequently change color, as with some herons, ibises, gulls, one of the bell-birds just noticed, etc. In the white ibis, the cheeks, the inflatable skin of the throat, and the basal portion of the beak, then become crimson.[71] In one of the rails, *Gallicrex cristatus*, a large red caruncle is developed during this same period on the head of the male. So it is with a thin horny crest on the beak of one of the pelicans, *P. erythrorhynchus;* for, after the breeding-season, these horny crests are shed, like horns from the heads of stags, and the shore of an island in a lake in Nevada was found covered with these curious exuviæ.[72]

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[70] Mr. Sclater, 'Intellectual Observer,' Jan. 1867. 'Waterton's Wanderings,' p. 118. See also Mr. Salvin's interesting paper, with a plate, in the 'Ibis,' 1865, p. 90.

[71] 'Land and Water,' 1867, p. 394.

Changes of color in the plumage according to the season depend firstly on a double annual moult, secondly on an actual change of color in the feathers themselves, and thirdly on their dull-colored margins being periodically shed, or on these three processes more or less combined. The shedding of the deciduary margins may be compared with the shedding by very young birds of their down; for the down in most cases arises from the summits of the first true feathers.[73]

With respect to the birds which annually undergo a double moult, there are, firstly, some kinds, for instance snipes, swallow-plovers (Glareolæ) and curlews, in which the two sexes resemble each other and do not change color at any season. I do not know whether the winter plumage is thicker and warmer than the summer plumage, which seems, when there is no change of color, the most probable cause of a double moult. Secondly, there are birds, for instance, certain species of Totanus and other grallatores, the sexes of which resemble each other, but have a slightly different summer and winter plumage. The difference, however, in color in these cases is so slight that it can hardly be an advantage to them; and it may, perhaps, be attributed to the direct action of the different conditions to which the birds are exposed during the two seasons. Thirdly, there are many other birds the sexes of which are alike, but which are widely different in their summer and winter plumage. Fourthly, there are birds, the sexes of which differ from each other in color; but the females, though moulting twice, retain the same colors throughout the year, while the males undergo a change, sometimes, as with certain bustards, a great change of color. Fifthly and lastly, there are birds the sexes of which differ from each other in both their summer and winter plumage, but the male undergoes a greater amount of change at each recurrent season than the female—of which the Ruff (*Machetes pugnax*) offers a good instance.

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[72] Mr. D. G. Elliot, in 'Proc. Zool. Soc.' 1869, p. 589.

[73] 'Nitzsch's Pterylography,' edited by P. L. Sclater. Ray Soc. 1867, p. 14.

With respect to the cause or purpose of the differences in color between the summer and winter plumage, this may in some instances, as with the ptarmigan,[74] serve during both seasons as a protection. When the difference between the two plumages is slight it may perhaps be attributed, as already remarked, to the direct action of the conditions of life. But with many birds there can hardly be a doubt that the summer plumage is ornamental, even when both sexes are alike. We may conclude that this is the case with many herons, egrets, etc., for they acquire their beautiful plumes only during the breeding-season. Moreover, such plumes, top-knots, etc., though possessed by both sexes, are occasionally a little more highly developed in the male than in the female; and they resemble the plumes and ornaments possessed by the males alone of other birds. It is also known that confinement, by affecting the reproductive system of male birds, frequently checks the development of their secondary sexual characters, but has no immediate influence on any other characters; and I am informed by Mr. Bartlett that eight or nine specimens of the Knot (*Tringa canutus*) retained their unadorned winter plumage in the Zoological Gardens throughout the year, from which fact we may infer that the summer plumage, though common to both sexes, partakes of the nature of the exclusively masculine plumage of many other birds.[75]

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[74] The brown mottled summer plumage of the ptarmigan is of as much importance to it, as a protection, as the white winter plumage; for, in Scandinavia, during the spring, when the snow has disappeared, this bird is known to suffer greatly from birds of prey, before it has acquired its summer dress: see Wilhelm von Wright, in Lloyd, 'Game-Birds of Sweden,' 1867, p. 125.

From the foregoing facts, more especially from neither sex of certain birds changing color during either annual moult, or changing so slightly that the change can hardly be of any service to them, and from the females of other species moulting twice, yet retaining the same colors throughout the year, we may conclude that the habit of moulting twice in the year has not been acquired in order that the male should assume during the breeding-season an ornamental character; but that the double moult, having been originally acquired for some distinct purpose, has subsequently been taken advantage of in certain cases for gaining a nuptial plumage.

It appears at first sight a surprising circumstance that, with closely-allied birds, some species should regularly undergo a double annual moult, and others only a single one. The ptarmigan, for instance, moults twice or even thrice in the year, and the blackcock only once: some of the splendidly-colored honey-suckers (Nectariniæ) of India and some sub-genera of obscurely-colored pipits (Anthus) have a double, while others have only a single annual moult.[76] But the gradations in the manner of moulting, which are known to occur with various birds, show us how species, or whole groups of species, might have originally acquired their double annual moult, or, having once gained the habit, have again lost it. With certain bustards and plovers the vernal moult is far from complete, some feathers being renewed, and some changed in color. There is also reason to believe that with certain bustards and rail-like birds, which properly undergo a double moult, some of the older males retain their nuptial plumage throughout the year. A few highly-modified feathers may alone be added during the spring to the plumage, as occurs with the disk-formed tail-feathers of certain drongos (*Bhringa*) in India, and with the elongated feathers on the back, neck, and crest, of certain herons. By such steps as these, the vernal moult might be rendered more and more complete, until a perfect double moult was acquired. A gradation can also be shown to exist in the length of time during which either annual plumage is retained; so that the one might come to be retained for the whole year, the other being completely lost. Thus the *Machetes pugnax* retains his ruff in the spring for barely two months. The male widow-bird (*Chera progne*) acquires in Natal his fine plumage and long tail-feathers in December or January, and loses them in March; so that they are retained during only about three months. Most species which undergo a double moult keep their ornamental feathers for about six months. The male, however, of the wild *Gallus bankiva* retains his neck-hackles for nine or ten months; and, when these are cast off, the underlying black feathers on the neck are fully exposed to view. But, with the domesticated descendant of this species, the neck-hackles of the male are immediately replaced by new ones; so that we here see, with respect to part of the plumage, a double moult changed under domestication into a single moult.[77]

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[75] In regard to the previous statements on moulting, see, on snipes, etc., Macgillivray, 'Hist. Brit. Birds,' vol. iv. p. 371; on Glareolæ, curlews, and bustards, Jerdon, 'Birds of India,' vol. iii. pp. 615, 630, 683; on Tetanus, ibid. p. 700; on the plumes of herons, ibid. p. 738, and Macgillivray, vol. iv. pp. 435, 444, and Mr. Stafford Allen, in the 'Ibis,' vol. v. 1863, p. 33.

[76] On the moulting of the ptarmigan, see Gould's 'Birds of Great Britain.' On the honey-suckers, Jerdon, 'Birds of India,' vol. i. pp. 359, 365, 369. On the moulting of Anthus, see Blyth, in 'Ibis,' 1867, p. 32.

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[77] For the foregoing statements in regard to partial moults, and on old males retaining their nuptial plumage, see Jerdon, on bustards and

The common drake (*Anas boschas*) is well known after the breeding-season to lose his male plumage for a period of three months, during which time he assumes that of the female. The male pintail-duck (*Anas acuta*) loses his plumage for the shorter period of six weeks or two months; and Montagu remarks that this double moult within so short a time is a most extraordinary circumstance, that seems to bid defiance to all human reasoning. But he who believes in the gradual modification of species will be far from feeling surprised at finding gradations of all kinds. If the male pintail were to acquire his new plumage within a still shorter period, the new male feathers would almost necessarily be mingled with the old, and both with some proper to the female; and this apparently is the case with the male of a not distantly-allied bird, namely the *Merganser serrator*, for the males are said to "undergo a change of plumage, which assimilates them in some measure to the female." By a little further acceleration in the process, the double moult would be completely lost.[78]

Some male birds, as before stated, become more brightly colored in the spring, not by a vernal moult, but either by an actual change of color in the feathers, or by their obscurely-colored deciduary margins being shed. Changes of color thus caused may last for a longer or shorter time. With the *Pelecanus onocrotalus* a beautiful rosy tint, with

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plovers, in 'Birds of India,' vol. iii. pp. 617, 637, 709, 711. Also Blyth in 'Land and Water,' 1867, p. 84. On the Vidua, 'Ibis,' vol. iii. 1861, p. 133. On the Drongo Shrikes, Jerdon, ibid. vol. i. p. 435. On the vernal moult of the *Herodias bubulcus*, Mr. S. S. Allen, in 'Ibis,' 1863, p. 33. On *Gallus bankiva*, Blyth, in 'Annals and Mag. of Nat. Hist.' vol. i. 1848, p. 455; see, also, on this subject, my 'Variation of Animals under Domestication,' vol. i. p. 236.

[78] See Macgillivray, 'Hist. British Birds' (vol. v. pp. 34, 70, 223), on the moulting of the Anatidæ, with quotations from Waterton and Montagu. Also Yarrell, 'Hist. of British Birds,' vol. iii. p. 243.

lemon-colored marks on the breast, overspreads the whole plumage in the spring; but these tints, as Mr. Sclater states, "do not last long, disappearing generally in about six weeks or two months after they have been attained." Certain finches shed the margins of their feathers in the spring, and then become bright-colored, while other finches undergo no such change. Thus the *Fringilla tristis* of the United States (as well as many other American species) exhibits its bright colors only when the winter is past, while our goldfinch, which exactly represents this bird in habits, and our siskin, which represents it still more closely in structure, undergo no such annual change. But a difference of this kind in the plumage of allied species is not surprising, for with the common linnet, which belongs to the same family, the crimson forehead and breast are displayed only during the summer in England, while in Madeira these colors are retained throughout the year.[79]

Display by Male Birds of their Plumage.—Ornaments of all kinds, whether permanently or temporarily gained, are sedulously displayed by the males, and apparently serve to excite, or attract, or charm, the females. But the males will sometimes display their ornaments, when not in the presence of the females, as occasionally occurs with grouse at their balz-places, and as may be noticed with the peacock; this latter bird, however, evidently wishes for a spectator of some kind, and will show off his finery, as I have often seen, before poultry or even pigs.[80] All naturalists who have closely attended to the habits of birds, whether in a state of nature or under confinement, are unanimously of opinion that the males delight to display their beauty. Audubon frequently speaks of the male as endeavoring in various ways to charm the female. Mr. Gould, after describing some peculiarities in a male humming-bird, says he has no doubt that it has the power of displaying them to the greatest advantage before the female. Dr. Jerdon[81] insists that the beautiful plumage of the male serves "to fascinate and attract the female." Mr. Bartlett, at the Zoological Gardens, expressed himself to me in the strongest terms to the same effect.

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[79] On the pelican, see Sclater, in 'Proc. Zool. Soc.' 1868, p. 265. On the American finches, see Audubon, 'Ornith. Biography,' vol. i. pp. 174, 221, and Jerdon, 'Birds of India,' vol. ii. p. 383. On the *Fringilla cannabina* of Madeira, Mr. E. Vernon Harcourt, 'Ibis,' vol. v. 1863, p. 230.

[80] See also 'Ornamental Poultry,' by Rev. E. S. Dixon, 1848, p. 8.

It must be a grand sight in the forest of India "to come suddenly on twenty or thirty pea-fowl, the males displaying their gorgeous trains, and strutting about in all the pomp of pride before the gratified females." The wild-turkey-cock erects his glittering plumage, expands his finely-zoned tail and barred wing-feathers, and altogether, with his gorged crimson and blue wattles, makes a superb, though, to our eyes, grotesque appearance. Similar facts have already been given with respect to grouse of various kinds· Turning to another Order. The male *Rupicola crocea* (Fig. 50) is one of the most beautiful birds in the world, being of a splendid orange, with some of the feathers curiously truncated and plumose. The female is brownish-green, shaded with red, and has a much smaller crest. Sir R. Schomburgk has described their courtship; he found one of their meeting-places where ten males and two females were present. The space was from four to five feet in diameter, and appeared to have been cleared of every blade of grass and smoothed as if by human hands. A male "was capering to the apparent delight of several others. Now spreading its wings, throwing up its head, or opening its tail like a fan; now strutting about with a hopping gait until tired, when it gabbled some kind of note, and was relieved by another.

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[81] 'Birds of India,' Introduct. vol. i. p. xxiv.; on the peacock, vol. iii. p. 507. See Gould's 'Introduction to the Trochilidæ,' 1861, pp. 15, 111.

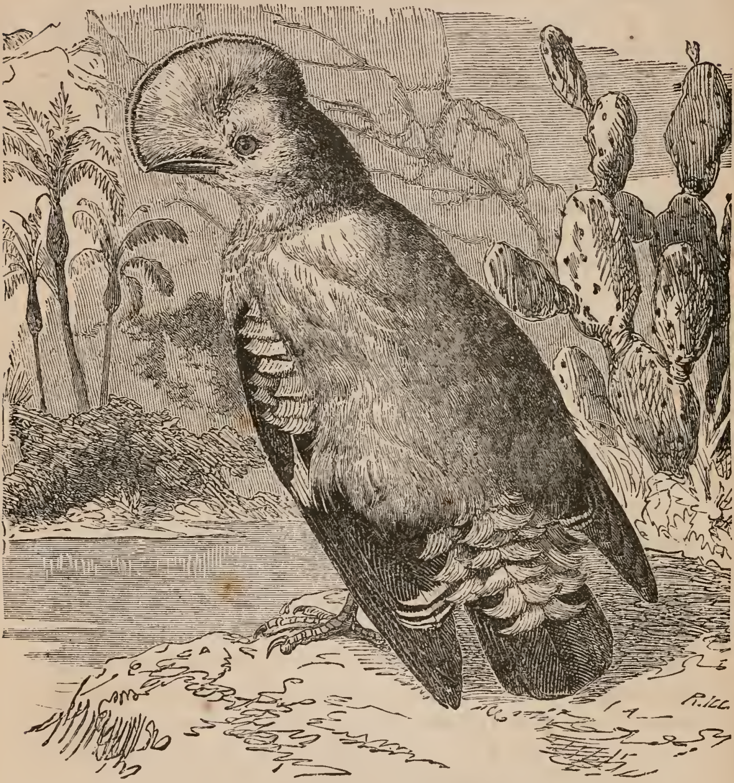

FIG. 50.—Rupicola crocea, male (from Brehm).

Thus three of them successively took the field, and then, with self-approbation, withdrew to rest." The Indians, in order to obtain their skins, wait at one of the meeting-places till the birds are eagerly engaged in dancing, and then are able to kill, with their poisoned arrows, four or five males, one after the other.[82] With Birds of Paradise a dozen or more full-plumaged males congregate in a tree to hold a dancing-party, as it is called by the natives; and here flying about, raising their wings, elevating their exquisite plumes, and making them vibrate, the whole tree seems, as Mr. Wallace remarks, to be filled with waving plumes. When thus engaged, they become so absorbed that a skilful archer may shoot nearly the whole party. These birds, when kept in confinement in the Malay Archipelago, are said to take much care in keeping their feathers clean; often spreading them out, examining them, and removing every speck of dirt. One observer, who kept several pairs alive, did not doubt that the display of the male was intended to please the female.[83]

The gold-pheasant (*Thaumalea picta*) during his courtship not only expands and raises his splendid frill, but turns it, as I have myself seen, obliquely toward the female on whichever side she may be standing, obviously in order that a large surface may be displayed before her.[84] Mr. Bartlett has observed a male Polyplectron (Fig. 51) in the act of courtship, and has shown me a specimen stuffed in the attitude then assumed. The tail and wing feathers of this bird are ornamented with beautiful ocelli, like those on the peacock's train. Now, when the peacock displays himself, he expands and erects his tail transversely to his body, for he stands in front of the female, and has to show off, at the same time, his rich blue throat and breast. But the breast of the Polyplectron is obscurely colored, and the ocelli are not confined to the tail-feathers. Consequently the Polyplectron does

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[82] 'Journal of R. Geograph. Soc.' vol. x. 1840, p. 236.

[83] 'Annals and Mag. of Nat. Hist.' vol. xiii. 1854, p. 157; also Wallace, ibid. vol. xx. 1857, p. 412, and 'The Malay Archipelago,' vol. ii. 1869, p. 252. Also Dr. Bennett, as quoted by Brehm, 'Thierleben,' B. iii. s. 326.

[84] Mr. T. W. Wood has given ('The Student,' April, 1870, p. 115) a full account of this manner of display, which he calls the lateral or one-sided, by the gold-pheasant and by the Japanese pheasant, *Ph. versicolor.*

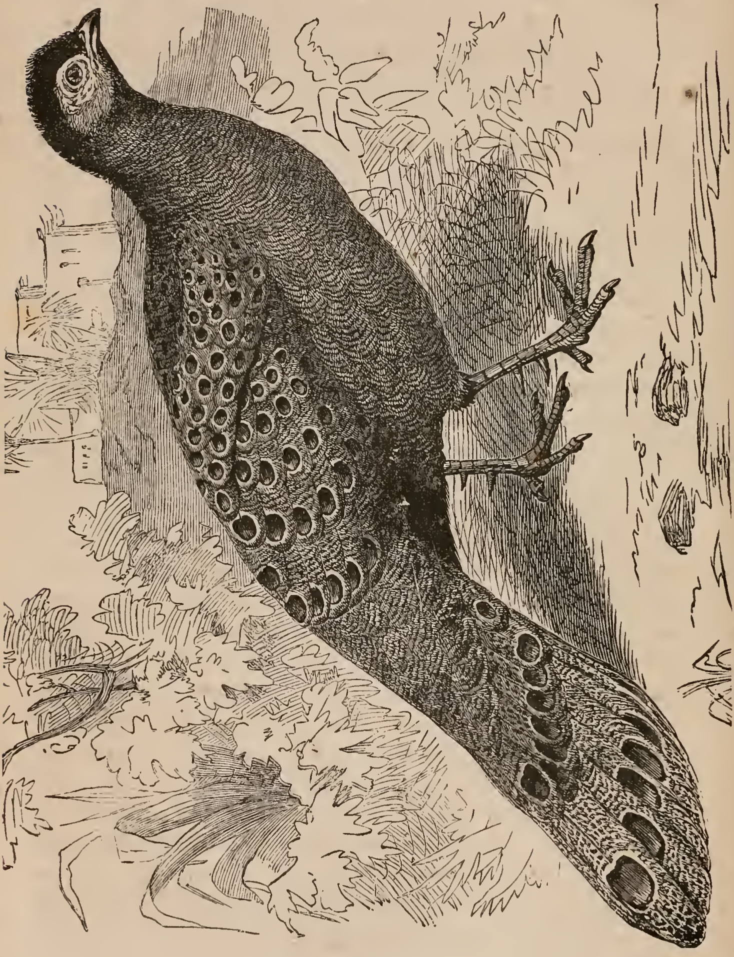

FIG. 51.—Polyplectron chinquis, male (from Brehm).

not stand in front of the female; but he erects and expands his tail-feathers a little obliquely, lowering the expanded wing on the same side, and raising that on the opposite side. In this attitude the ocelli over the whole body are exposed before the eyes of the admiring female in one grand bespangled expanse. To whichever side she may turn, the expanded wings and the obliquely-held tail are turned toward her. The male Tragopan pheasant acts in nearly the same manner, for he raises the feathers of the body, though not the wing itself, on the side which is opposite to the female, and which would otherwise be concealed, so that nearly all the beautifully-spotted feathers are exhibited at the same time.

The case of the Argus pheasant is still more striking The immensely-developed secondary wing-feathers, which are confined to the male, are ornamented with a row of from twenty to twenty-three ocelli, each above an inch in diameter. The feathers are also elegantly marked with oblique dark stripes and rows of spots, like those on the skin of a tiger and leopard combined. The ocelli are so beautifully shaded that, as the Duke of Argyll remarks,[85] they stand out like a ball lying loosely within a socket. But when I looked at the specimen in the British Museum, which is mounted with the wings expanded and trailing downward, I was greatly disappointed, for the ocelli appeared flat or even concave. Mr. Gould, however, soon made the case clear to me, for he had made a drawing of a male while he was displaying himself. At such times the long secondary feathers in both wings are vertically erected and expanded; and these, together with the enormously-elongated tail-feathers, make a grand semicircular upright fan. Now as soon as the wing-feathers are held in this position, and the light shines on them from above, the full effect of the shading comes out, and each ocellus at once resembles the ornament called a ball and socket. These feathers have been shown to several artists, and all have expressed their admiration at the perfect shading. It may well be asked, Could such artistically-shaded ornaments have been formed by means of sexual selection? But it will be convenient to defer giving an answer to this question until we treat in the next chapter of the principle of gradation.

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[85] 'The Reign of Law,' 1867, p. 203.

The primary wing-feathers, which in most gallinaceous birds are uniformly colored, are in the Argus pheasant not less wonderful objects than the secondary wing-feathers. They are of a soft brown tint with numerous dark spots, each of which consists of two or three black dots with a surrounding dark zone. But the chief ornament is a space parallel to the dark-blue shaft, which in outline forms a perfect second feather lying within the true feather. This inner part is colored of a lighter chestnut, and is thickly dotted with minute white points. I have shown this feather to several persons, and many have admired it even more than the ball-and-socket feathers, and have declared that it was more like a work of art than of Nature. Now these feathers are quite hidden on all ordinary occasions, but are fully displayed when the long secondary feathers are erected, though in a widely-different manner; for they are expanded in front like two little fans or shields, one on each side of the breast near the ground.

The case of the male Argus pheasant is eminently interesting, because it affords good evidence that the most refined beauty may serve as a charm for the female, and for no other purpose. We must conclude that this is the case, as the primary wing-feathers are never displayed, and the ball-and-socket ornaments are not exhibited in full perfection, except when the male assumes the attitude of courtship. The Argus pheasant does not possess brilliant colors, so that his success in courtship appears to have depended on the great size of his plumes, and on the elaboration of the most elegant patterns. Many will declare that it is utterly incredible that a female bird should be able to appreciate fine shading and exquisite patterns. It is undoubtedly a marvellous fact that she should possess this almost human degree of taste, though perhaps she admires the general effect rather than each separate detail. He who thinks that he can safely gauge the discrimination and taste of the lower animals, may deny that the female Argus pheasant can appreciate such refined beauty; but he will then be compelled to admit that the extraordinary attitudes assumed by the male during the act of courtship, by which the wonderful beauty of his plumage is fully displayed, are purposeless; and this is a conclusion which I for one will never admit.

Although so many pheasants and allied gallinaceous birds carefully display their beautiful plumage before the females, it is remarkable, as Mr. Bartlett informs me, that this is not the case with the dull-colored Eared and Cheer pheasants (*Crossoptilon auritum* and *Phasianus Wallichii*); so that these birds seem conscious that they have little beauty to display. Mr. Bartlett has never seen the males of either of these species fighting together, though he has not had such good opportunities for observing the Cheer as the Eared pheasant. Mr. Jenner Weir, also, finds that all male birds with rich or strongly-characterized plumage are more quarrelsome than the dull-colored species belonging to the same groups. The goldfinch, for instance, is far more pugnacious than the linnet, and the blackbird than the thrush. Those birds which undergo a seasonal change of plumage likewise become much more pugnacious at the period when they are most gayly ornamented. No doubt the males of some obscurely-colored birds fight desperately together, but it appears that when sexual selection has been highly influential, and has given bright colors to the males of any species, it has also very often given a strong tendency to pugnacity. We shall meet with nearly analogous cases when we treat of mammals. On the other hand, with birds the power of song and brilliant colors have rarely been both acquired by the males of the same species; but in this case, the advantage gained would have been identically the same, namely, success in charming the female. Nevertheless, it must be owned that the males of several brilliantly-colored birds have had their feathers specially modified for the sake of producing instrumental music, though the beauty of this cannot be compared, at least according to our taste, with that of the vocal music of many songsters.

We will now turn to male birds which are not ornamented in any very high degree, but which nevertheless display, during their courtship, whatever attractions they may possess. These cases are in some respects more curious than the foregoing, and have been but little noticed. I owe the following facts, selected from a large body of valuable notes, sent to me by Mr. Jenner Weir, who has long kept birds of many kinds, including all the British Fringillidæ and Emberizidæ. The bullfinch makes his advances in front of the female, and then puffs out his breast, so that many more of the crimson feathers are seen at once than otherwise would be the case. At the same time he twists and bows his black tail from side to side in a ludicrous manner. The male chaffinch also stands in front of the female, thus showing his red breast, and "blue-bell," as the fanciers call his head; the wings at the same time being slightly expanded, with the pure white bands on the shoulders thus rendered conspicuous. The common linnet distends his rosy breast, slightly expands his brown wings and tail, so as to make the best of them by exhibiting their white edgings. We must, however, be cautious in concluding that the wings are spread out solely for display, as some birds act thus whose wings are not beautiful. This is the case with the domestic cock, but it is always the wing on the side opposite to the female which is expanded, and at the same time scraped on the ground. The male goldfinch behaves differently from all other finches: his wings are beautiful, the shoulders being black, with the dark-tipped wing-feathers spotted with white and edged with golden yellow. When he courts the female, he sways his body from side to side, and quickly turns his slightly-expanded wings first to one side then to the other, with a golden flashing effect. No other British finch, as Mr. Weir informs me, turns during his courtship from side to side in this manner; not even the closely-allied male siskin, for he would not thus add to his beauty.

Most of the British Buntings are plain-colored birds; but in the spring the feathers on the head of the male reed-bunting (*Emberiza schœniculus*) acquire a fine black color by the abrasion of the dusky tips; and these are erected during the act of courtship. Mr. Weir has kept two species of Amadina from Australia: the *A. castanotis* is a very small and chastely-colored finch, with a dark tail, white rump, and jet-black upper tail-coverts, each of the latter being marked with three large conspicuous oval spots of white.[86] This species, when courting the female, slightly spreads out and vibrates these party-colored tail-coverts in a very peculiar manner. The male *Amadina Lathami* behaves very differently, exhibiting before the female his brilliantly-spotted breast and scarlet rump, and scarlet upper tail-coverts. I may here add from Dr. Jerdon, that the Indian Bulbul (*Pycnonotus hæmorrhous*) has crimson *under* tail-coverts, and the beauty of these feathers, it might be thought, could never be well exhib-

[86] For the description of these birds, see Gould's 'Hand-book to the Birds of Australia,' vol i. 1865, p. 417.

ited; but the bird "when excited often spreads them out laterally, "so that they can be seen even from above."[87] The common pigeon has iridescent feathers on the breast, and every one must have seen how the male inflates his breast while courting the female, thus showing off these feathers to the best advantage. One of the beautiful bronze-winged pigeons of Australia (*Ocyphaps lophotes*) behaves, as described to me by Mr. Weir, very differently: the male, while standing before the female, lowers his head almost to the ground, spreads out and raises perpendicularly his tail, and half expands his wings. He then alternately and slowly raises and depresses his body, so that the iridescent metallic feathers are all seen at once, and glitter in the sun.

Sufficient facts have now been given to show with what care male birds display their various charms, and this they do with the utmost skill. While preening their feathers, they have frequent opportunities for admiring themselves, and of studying how best to exhibit their beauty. But as all the males of the same species display themselves in exactly the same manner, it appears that actions, at first perhaps intentional, have become instinctive. If so, we ought not to accuse birds of conscious vanity; yet when we see a peacock strutting about, with expanded and quivering tail-feathers, he seems the very emblem of pride and vanity.

The various ornaments possessed by the males are certainly of the highest importance to them, for they have been acquired in some cases at the expense of greatly-impeded powers of flight or of running. The African night-jar (*Cosmetornis*), which during the pairing-season has one of its primary wing-feathers developed into a streamer of extreme length, is thus much retarded in its flight, although at other times remarkable for its swiftness. The

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[87] 'Birds of India,' vol. ii. p. 96.

"unwieldly size" of the secondary wing-feathers of the male Argus pheasant are said "almost entirely to deprive the bird of flight." The fine plumes of male Birds of Paradise trouble them during a high wind. The extremely long tail-feathers of the male widow-birds (Vidua) of Southern Africa render "their flight heavy;" but as soon as these are cast off they fly as well as the females. As birds always breed when food is abundant, the males probably do not suffer much inconvenience in searching for food from their impeded powers of movement; but there can hardly be a doubt that they must be much more liable to be struck down by birds of prey. Nor can we doubt that the long train of the peacock and the long tail and wing feathers of the Argus pheasant must render them a more easy prey to any prowling tiger-cat than would otherwise be the case. Even the bright colors of many male birds cannot fail to make them conspicuous to their enemies of all kinds. Hence it probably is, as Mr. Gould has remarked, that such birds are generally of a shy disposition, as if conscious that their beauty was a source of danger, and are much more difficult to discover or approach, than the sombre-colored and comparatively tame females, or than the young and as yet unadorned males.[88]

It is a more curious fact that the males of some birds which are provided with special weapons for battle, and which in a state of nature are so pugnacious that they often kill each other, suffer from possessing certain ornaments. Cock-fighters trim the hackles and cut off the comb and gills of their cocks; and the birds are then said to be dubbed. An undubbed bird, as Mr. Tegetmeier insists, "is at a fearful disadvantage: the comb and gills offer an easy hold to his adversary's beak, and as a cock always strikes where he holds, when once he has seized his foe, he has him entirely in his power. Even supposing that the bird is not killed, the loss of blood suffered by an undubbed cock is much greater than that sustained by one that has been trimmed."[89] Young turkey-cocks in fighting always seize hold of each other's wattles; and I presume that the old birds fight in the same manner. It may perhaps be objected that the comb and wattles are not ornamental, and cannot be of service to the birds in this way; but even to our eyes, the beauty of the glossy black Spanish cock is much enhanced by his white face and crimson comb; and no one who has ever seen the splendid blue wattles of the male Tragopan pheasant, when distended during the act of courtship, can for a moment doubt that beauty is the object gained. From the foregoing facts we clearly see that the plumes and other ornaments of the male must be of the highest importance to him; and we further see that beauty in some cases is even more important than success in battle.

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[88] On the Cosmetornis, see Livingstone's 'Expedition to the Zambesi,' 1865, p. 66. On the Argus pheasant, Jardine's 'Nat. Hist. Lib.: Birds,' vol. xiv. p. 167. On Birds of Paradise, Lesson, quoted by Brehm, 'Thierleben,' B. iii. s. 325. On the widow-bird, Barrow's 'Travels in Africa,' vol. i. p. 243, and 'Ibis,' vol. iii. 1861, p. 133. Mr. Gould on the shyness of male-birds, 'Hand-book to Birds of Australia,' vol i. 1865, pp. 210, 457.

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[89] Tegetmeier, 'The Poultry-Book,' 1866, p. 139.

CHAPTER XIV.

Birds—*continued.*

Choice exerted by the Female.—Length of Courtship.—Unpaired Birds.—Mental Qualities and Taste for the Beautiful.—Preference or Antipathy shown by the Female for Particular Males.—Variability of Birds.—Variations sometimes abrupt.—Laws of Variation.—Formation of Ocelli.—Gradations of Character.—Case of Peacock, Argus Pheasant, and Urosticte.

When the sexes differ in beauty, in the power of singing, or in producing what I have called instrumental music, it is almost invariably the male which excels the female. These qualities, as we have just seen, are evidently of high importance to the male. When they are gained for only a part of the year, this is always shortly before the breeding-season. It is the male alone who elaborately displays his varied attractions, and often performs strange antics on the ground or in the air, in the presence of the female. Each male drives away, or, if he can, kills all his rivals. Hence we may conclude that it is the object of the male to induce the female to pair with him, and for this purpose he tries to excite or charm her in various ways; and this is the opinion of all those who have carefully studied the habits of living birds. But there remains a question which has an all-important bearing on sexual selection, namely, Does every male of the same species equally excite and attract the female? or does she exert a choice, and prefer certain males? This question can be answered in the affirmative by much direct and indirect evidence. It is much more difficult to decide what qualities determine the choice of the females; but here again we have some direct and indirect evidence that it is to a large extent the external attractions of the male, though no doubt his vigor, courage, and other mental qualities, come into play. We will begin with the indirect evidence.

Length of Courtship.—The lengthened period during which both sexes of certain birds meet day after day at an appointed place, probably depends partly on the courtship being a prolonged affair, and partly on the reiteration of the act of pairing. Thus in Germany and Scandinavia the balzens or leks of the Blackcocks last from the middle of March, all through April into May. As many as forty or fifty, or even more, birds congregate at the leks; and the same place is often frequented during successive years. The lek of the Capercailzie lasts from the end of March to the middle or even end of May. In North America "the partridge-dances" of the *Tetrao phasianellus* "last for a month or more." Other kinds of grouse both in North America and Eastern Siberia[1] follow nearly the same habits. The fowlers discover the hillocks where the Ruffs congregate by the grass being trampled bare, and this shows that the same spot is long frequented. The Indians of Guiana are well acquainted with the cleared arenas, where they expect to find the beautiful Cocks of the Rock; and the natives of New Guinea know the trees where from ten to twenty full-plumaged male Birds of Paradise congregate. In this latter case it is not expressly stated that the females meet on the same trees, but the hunters, if not specially asked, would not probably mention their presence, as their skins are valueless. Small parties of an African weaver (*Ploceus*) congregate, during the breeding-season, and perform for hours their graceful evolutions. Large numbers of the Solitary snipe (*Scolopax major*) assemble during the dusk in a morass; and the same place is frequented for the same purpose during successive years; here they may be seen running about "like so many large rats," puffing out their feathers, flapping their wings, and uttering the strangest cries.[2]

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[1] Nordmann describes ('Bull. Soc. Imp. des Nat. Moscow,' 1861, tome xxxiv. p. 264) the balzen of *Tetrao urogalloides* in Amur Land. He estimated the number of assembled males at above a hundred, the females, which lie hid in the surrounding bushes, not being counted. The noises uttered differ from those of the *T. urogallus* or the capercailzie.

Some of the above-mentioned birds, namely, the black-cock, capercailzie, pheasant-grouse, the ruff, the Solitary snipe, and perhaps some others, are, as it is believed, polygamists. With such birds it might have been thought that the stronger males would simply have driven away the weaker, and then at once have taken possession of as many females as possible; but if it be indispensable for the male to excite or please the female, we can understand the length of the courtship and the congregation of so many individuals of both sexes at the same spot. Certain species which are strictly monogamous likewise hold nuptial assemblages; this seems to be the case in Scandinavia with one of the ptarmigans, and their leks last from the middle of March to the middle of May. In Australia the lyre-bird or *Menura superba* forms "small round hillocks," and the *M. Alberti* scratches for itself shallow holes, or, as they are called by the natives, *corroborying-places*, where it is believed both sexes assemble. The meetings of the *M. superba* are sometimes very large; and an account has lately been published[3] by a traveller, who heard in a valley beneath him, thickly covered with scrub, "a din which completely astonished" him; on crawling onward he beheld to his amazement about one hundred and fifty of the magnificent lyre-cocks, "ranged in order of battle, and fighting with indescribable fury." The bowers of the Bower-birds are the resort of both sexes during the breeding-season; and "here the males meet and contend with each other for the favors of the female, and here the latter assemble and coquet with the males." With two of the genera, the same bower is resorted to during many years.[4]

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[2] With respect to the assemblages of the above-named grouse, see Brehm, 'Thierleben,' B. iv. s. 350; also L. Lloyd, 'Game-Birds of Sweden,' 1867, pp. 19, 78. Richardson, 'Fauna Bor. Americana,' Birds, p. 362. References in regard to the assemblages of other birds have previously been given. On Paradisea, see Wallace, in 'Annals and Mag. of Nat. Hist.' vol. xx 1857, p. 412. On the snipe, Lloyd, ibid. p. 221.

The common magpie (*Corvus pica*, Linn.), as I have been informed by the Rev. W. Darwin Fox, used to assemble from all parts of Delamere Forest, in order to celebrate the "great magpie marriage." Some years ago these birds abounded in extraordinary numbers, so that a gamekeeper killed in one morning nineteen males, and another killed by a single shot seven birds at roost together. While they were so numerous, they had the habit very early in the spring of assembling at particular spots, where they could be seen in flocks, chattering, sometimes fighting, bustling and flying about the trees. The whole affair was evidently considered by the birds as of the highest importance. Shortly after the meeting they all separated, and were then observed by Mr. Fox and others to be paired for the season. In any district in which a species does not exist in large numbers, great assemblages cannot, of course, be held, and the same species may have different habits in different countries. For instance, I have never met with any account of regular assemblages of black game in Scotland, yet these assemblages are so well known in Germany and Scandinavia that they have special names.

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[3] Quoted by Mr. T. W. Wood in the 'Student,' April, 1870, p. 125.

[4] Gould, 'Hand-book of Birds of Australia,' vol. i. pp. 300, 308, 448 451. On the ptarmigan, above alluded to, see Lloyd, ibid. p. 129.

Unpaired Birds.—From the facts now given, we may conclude that with birds belonging to widely-different groups their courtship is often a prolonged, delicate, and troublesome affair. There is even reason to suspect, improbable as this will at first appear, that some males and females of the same species, inhabiting the same district, do not always please each other, and in consequence do not pair. Many accounts have been published of either the male or female of a pair having been shot, and quickly replaced by another. This has been observed more frequently with the magpie than with any other bird, owing perhaps to its conspicuous appearance and nest. The illustrious Jenner states that in Wiltshire one of a pair was daily shot no less than seven times successively, "but all to no purpose, for the remaining magpie soon found another mate;" and the last pair reared their young. A new partner is generally found on the succeeding day; but Mr. Thompson gives the case of one being replaced on the evening of the same day. Even after the eggs are hatched, if one of the old birds is destroyed, a mate will often be found; this occurred after an interval of two days, in a case recently observed by one of Sir J. Lubbock's keepers.[5] The first and most obvious conjecture is, that male magpies must be much more numerous than the females; and that in the above cases, as well as in many others which could be given, the males alone had been killed. This apparently holds good in some instances, for the game-keepers in Delamere Forest assured Mr. Fox that the magpies and carrion-crows which they formerly killed in succession in large numbers near their nests were all males; and they accounted for this fact by the males being easily killed while bringing food to the sitting females. Macgillivray, however, gives, on the authority of an excellent observer, an instance of three magpies successively killed on the same nest, which were all females; and another case of six magpies successively killed while sitting on the same eggs, which renders it probable that most of them were females, though the male will sit on the eggs, as I hear from Mr. Fox, when the female is killed.

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[5] On magpies, Jenner, in 'Phil. Transact.' 1824, p. 21. Macgillivray, 'Hist. British Birds,' vol. i. p. 570. Thompson, in 'Annals and Mag. of Nat. Hist.' vol. viii. 1842, p. 494.

Sir J. Lubbock's game-keeper has repeatedly shot, but how many times he could not say, one of a pair of jays (*Garrulus glandarius*), and has never failed shortly afterward to find the survivor rematched. The Rev. W. D. Fox, Mr. F. Bond, and others, have shot one of a pair of carrion-crows (*Corvus corone*), but the nest was soon again tenanted by a pair. These birds are rather common; but the peregrine falcon (*Falco peregrinus*) is rare, yet Mr. Thompson states that in Ireland "if either an old male or female be killed in the breeding-season (not an uncommon circumstance), another mate is found within a very few days, so that the eyries, notwithstanding such casualties, are sure to turn out their complement of young." Mr. Jenner Weir has known the same thing to occur with the peregrine falcons at Beachy Head. The same observer informs me that three kestrels, all males (*Falco tinnunculus*), were killed one after the other while attending the same nest; two of these were in mature plumage, and the third in the plumage of the previous year. Even with the rare golden eagle (*Aquila chrysaëtos*), Mr. Birkbeck was assured by a trustworthy game-keeper in Scotland, that if one is killed, another is soon found. So with the white owl (*Strix flammea*), it has been observed that "the survivor readily found a mate, and the mischief went on."

White of Selborne, who gives the case of the owl, adds that he knew a man who, from believing that partridges when paired were disturbed by the males fighting, used to shoot them; and, though he had widowed the same female several times, she was always soon provided with a fresh partner. This same naturalist ordered the sparrows, which deprived the house-martins of their nests, to be shot: but the one which was left, "be it cock or hen, presently procured a mate, and so for several times following." I could add analogous cases relating to the chaffinch, nightingale, and redstart. With respect to the latter bird (*Phœnicura ruticilla*), the writer remarks that it was by no means common in the neighborhood, and he expresses much surprise how the sitting female could so soon give effectual notice that she was a widow. Mr. Jenner Weir has mentioned to me a nearly similar case: at Blackheath he never sees or hears the note of the wild bullfinch, yet when one of his caged males has died, a wild one in the course of a few days has generally come and perched near the widowed female, whose call-note is far from loud. I will give only one other fact, on the authority of this same observer; one of a pair of starlings (*Sturnus vulgaris*) was shot in the morning; by noon a new mate was found; this was again shot, but before night the pair was complete; so that the disconsolate widow or widower was thrice consoled during the same day. Mr. Engleheart also informs me that he used during several years to shoot one of a pair of starlings which built in a hole in a house at Blackheath; but the loss was always immediately repaired. During one season he kept an account and found that he had shot thirty-five birds from the same nest; these consisted of both males and females, but in what proportion he could not say·

nevertheless after all this destruction, a brood was reared.[6]

These facts are certainly remarkable. How is it that so many birds are ready immediately to replace a lost mate? Magpies, jays, carrion-crows, partridges, and some other birds, are never seen during the spring by themselves, and these offer at first sight the most perplexing case. But birds of the same sex, although of course not truly paired, sometimes live in pairs or in small parties, as is known to be the case with pigeons and partridges. Birds also sometimes live in triplets, as has been observed with starlings, carrion-crows, parrots, and partridges. With partridges two females have been known to live with one male, and two males with one female. In all such cases it is probable that the union would be easily broken. The males of certain birds may occasionally be heard pouring forth their love-song long after the proper time, showing that they have either lost or never gained a mate. Death from accident or disease of either one of a pair, would leave the other bird free and single; and there is reason to believe that female birds during the breeding-season are especially liable to premature death. Again, birds which have had their nests destroyed, or barren pairs, or retarded individuals, would easily be induced to desert their mates, and would probably be glad to take what share they could of the pleasures and duties of rearing offspring, although not their own.[7] Such contingencies as these probably explain most of the foregoing cases.[8] Nevertheless it is a strange fact that within the same district, during the height of the breeding-season, there should be so many males and females always ready to repair the loss of a mated bird. Why do not such spare birds immediately pair together? Have we not some reason to suspect, and the suspicion has occurred to Mr. Jenner Weir, that inasmuch as the act of courtship appears to be with many birds a prolonged and tedious affair, so it occasionally happens that certain males and females do not succeed, during the proper season, in exciting each other's love, and consequently do not pair? This suspicion will appear somewhat less improbable after we have seen what strong antipathies and preferences female birds occasionally evince toward particular males.

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[6] On the Peregrine falcon see Thompson, 'Nat. Hist. of Ireland: Birds,' vol. i. 1849, p. 39. On owls, sparrows, and partridges, see White, 'Nat. Hist. of Selborne,' edit. of 1825, vol. i. p. 139. On the Phœnicura, see Loudon's 'Mag. of Nat. Hist.' vol. vii. 1834, p. 245. Brehm ('Thierleben,' B. iv. s. 991) also alludes to cases of birds thrice mated during same day.

[7] See White ('Nat. Hist. of Selborne,' 1825, vol. i. p. 140) on the existence, early in the season, of small coveys of male partridges, of which fact I have heard other instances. See Jenner, on the retarded state of

Mental Qualities of Birds and their Taste for the Beautiful.—Before we discuss any further the question whether the females select the more attractive males, or

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the generative organs in certain birds, in 'Phil. Transact.' 1824. In regard to birds living in triplets, I owe to Mr. Jenner Weir the cases of the starling and parrots, and to Mr. Fox, of partridges; on carrion-crows, see the 'Field,' 1868, p. 415. On various male birds singing after the proper period, see Rev. L. Jenyns, 'Observations in Natural History,' 1846, p. 87.

[8] The following case has been given ('The Times,' Aug. 6, 1868) by the Rev. F. O. Morris, on the authority of the Hon. and Rev. O. W. Forester. "The game-keeper here found a hawk's nest this year, with five young ones in it. He took four and killed them, but left one with its wings clipped as a decoy to destroy the old ones by. They were both shot next day in the act of feeding the young one, and the keeper thought it was done with. The next day he came again and found two other charitable hawks, who had come with an adopted feeling to succor the orphan. These two he killed, and then left the nest. On returning afterward he found two more charitable individuals on the same errand of mercy. One of these he killed; the other he also shot, but could not find. No more came on the like fruitless errand."

accept the first whom they may encounter, it will be advisable briefly to consider the mental powers of birds. Their reason is generally, and perhaps justly, ranked as low; yet some facts could be given[9] leading to an opposite conclusion. Low powers of reasoning, however, are compatible, as we see with mankind, with strong affections, acute perception, and a taste for the beautiful; and it is with these latter qualities that we are here concerned. It has often been said that parrots become so deeply attached to each other that when one dies the other for a long time pines; but Mr. Jenner Weir thinks that with most birds the strength of their affection has been much exaggerated. Nevertheless when one of a pair in a state of nature has been shot, the survivor has been heard for days afterward uttering a plaintive call; and Mr. St. John gives[10] various facts proving the attachment of mated birds. Starlings, however, as we have seen, may be consoled thrice in the same day for the loss of their mates. In the Zoological Gardens parrots have clearly recognized their former masters after an interval of some months. Pigeons have such excellent local memories that they have been known to return to their former homes after an interval of nine months, yet, as I hear from Mr. Harrison Weir, if a pair which would naturally remain mated for life be separated for a few weeks during the winter and matched with other birds, the two, when brought together again, rarely, if ever, recognize each other.

Birds sometimes exhibit benevolent feelings; they will feed the deserted young even of distinct species, but this perhaps ought to be considered as a mistaken instinct. They will also feed, as shown in an earlier part of this work, adult birds of their own species which have become blind. Mr. Buxton gives a curious account of a parrot which took care of a frost-bitten and crippled bird of a distinct species, cleansed her feathers and defended her from the attacks of the other parrots which roamed freely about his garden. It is a still more curious fact that these birds apparently evince some sympathy for the pleasures of their fellows. When a pair of cockatoos made a nest in an acacia-tree, "it was ridiculous to see the extravagant interest taken in the matter by the others of tne same species." These parrots, also, evinced unbounded curiosity, and clearly had "the idea of property and possession." [11]

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[9] For instance, Mr. Yarrell states ('Hist. British Birds,' vol. iii. 1845, p. 585) that a gull was not able to swallow a small bird which had been given to it. The gull "paused for a moment, and then, as if suddenly recollecting himself, ran off at full speed to a pan of water, shook the bird about in it until well soaked, and immediately gulped it down. Since that time he invariably has had recourse to the same expedient in similar cases."

[10] 'Tour in Sutherlandshire,' vol. i. 1849, p. 185.

Birds possess acute powers of observation. Every mated bird, of course, recognizes its fellow. Audubon states that with the mocking-thrushes of the United States (*Mimus polyglottus*) a certain number remain all the year round in Louisiana, while the others migrate to the Eastern States; these latter, on their return, are instantly recognized, and always attacked, by their Southern brethren. Birds under confinement distinguish different persons, as is proved by the strong and permanent antipathy or affection which they show, without any apparent cause, toward certain individuals. I have heard of numerous instances with jays, partridges, canaries, and especially bullfinches. Mr. Hussy has described in how extraordinary a manner a tame partridge recognized everybody; and its likes and dislikes were very strong. This bird seemed "fond of gay colors, and no new gown or cap could be put on without catching his attention."[12] Mr. Hewitt has carefully described the habits of some ducks (recently descended from wild birds), which, at the approach of a strange dog or cat, would rush headlong into the water, and exhaust themselves in their attempts to escape; but they knew so well Mr. Hewitt's own dogs and cats that they would lie down and bask in the sun close to them. They always moved away from a strange man, and so they would from the lady who attended them if she made any great change in her dress. Audubon relates that he reared and tamed a wild-turkey which always ran away from any strange dog; this bird escaped into the woods; and some days afterward Audubon saw, as he thought, a wild-turkey, and made his dog chase it; but to his astonishment, the bird did not run away, and the dog, when he came up, did not attack the bird, for they mutually recognized each other as old friends.[13]

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[11] Acclimatization of Parrots,' by C. Buxton, M. P. 'Annals and Mag. of Nat. Hist.' Nov. 1868, p. 381.

Mr. Jenner Weir is convinced that birds pay particular attention to the colors of other birds, sometimes out of jealousy, and sometimes as a sign of kinship. Thus he turned a reed-bunting (*Emberiza schœniculus*), which had acquired its black head, into his aviary, and the new-comer was not noticed by any bird, except by a bullfinch, which is likewise black-headed. This bullfinch was a very quiet bird, and had never before quarrelled with any of its comrades, including another reed-bunting, which had not as yet become black-headed: but the reed-bunting with a black head was so unmercifully treated, that it had to be removed. Mr. Weir was also obliged to turn out a robin, as it fiercely attacked all birds with any red in their plumage, but no other kinds; it actually killed a red-breasted crossbill, and nearly killed a goldfinch. On the other hand, he has observed that some birds, when first introduced into his aviary, fly toward the species which resemble them most in color, and settle by their sides.

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[12] 'The Zoologist,' 1847–1848, p. 1602.

[13] Hewitt on wild ducks, 'Journal of Horticulture,' Jan. 13, 1863, p. 39. Audubon on the wild-turkey, 'Ornith. Biography,' vol. i. p. 14. On the mocking thrush, ibid. vol. i. p. 110.

As male birds display with so much care their fine plumage and other ornaments in the presence of the females, it is obviously probable that these appreciate the beauty of their suitors. It is, however, difficult to obtain direct evidence of their capacity to appreciate beauty. When birds gaze at themselves in a looking-glass (of which many instances have been recorded) we cannot feel sure that it is not from jealousy at a supposed rival, though this is not the conclusion of some observers. In other cases it is difficult to distinguish between mere curiosity and admiration. It is perhaps the former feeling which, as stated by Lord Lilford,[14] attracts the Ruff strongly toward any bright object, so that, in the Ionian Islands, it "will dart down to a bright-colored handkerchief, regardless of repeated shots." The common lark is drawn down from the sky, and is caught in large numbers, by a small mirror made to move and glitter in the sun. Is it admiration or curiosity which leads the magpie, raven, and some other birds, to steal and secrete bright objects, such as silver articles or jewels?

Mr. Gould states that certain humming-birds decorate the outside of their nests "with the utmost taste; they instinctively fasten thereon beautiful pieces of flat lichen, the larger pieces in the middle, and the smaller on the part attached to the branch. Now and then a pretty feather is intertwined or fastened to the outer sides, the stem being always so placed that the feather stands out beyond the surface." The best evidence, however, of a taste for the beautiful is afforded by the three genera of Australian bower-birds already mentioned. Their bowers (see Fig.

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[14] The 'Ibis,' vol. ii. 1860, p. 344.

46, p. 67), where the sexes congregate and play strange antics, are differently constructed, but what most concerns us is, that they are decorated in a different manner by the several species. The Satin bower-bird collects gayly-colored articles, such as the blue tail-feathers of parrakeets, bleached bones and shells, which it sticks between the twigs, or arranges at the entrance. Mr. Gould found in one bower a neatly-worked stone tomahawk and a slip of blue cotton, evidently procured from a native encampment. These objects are continually rearranged, and carried about by the birds while at play. The bower of the Spotted bower-bird "is beautifully lined with tall grasses, so disposed that the heads nearly meet, and the decorations are very profuse." Round stones are used to keep the grass-stems in their proper places, and to make divergent paths leading to the bower. The stones and shells are often brought from a great distance. The Regent-bird, as described by Mr. Ramsay, ornaments its short bower with bleached land-shells belonging to five or six species, and with "berries of various colors, blue, red, and black, which give it when fresh a very pretty appearance. Besides these there were several newly-picked leaves and young shoots of a pinkish color, the whole showing a decided taste for the beautiful." Well may Mr. Gould say "these highly-decorated halls of assembly must be regarded as the most wonderful instances of bird-architecture yet discovered;" and the taste, as we see, of the several species certainly differs.[15]

Preference for Particular Males by the Females.—Having made these preliminary remarks on the discrimination and taste of birds, I will give all the facts known to me, which bear on the preference shown by the female for particular males. It is certain that distinct species of birds occasionally pair in a state of nature and produce hybrids. Many instances could be given: thus Macgillivray relates how a male blackbird and female thrush "fell in love with each other," and produced offspring.[16] Several years ago eighteen cases had been recorded of the occurrence in Great Britain of hybrids between the black grouse and pheasant;[17] but most of these cases may perhaps be accounted for by solitary birds not finding one of their own species to pair with. With other birds, as Mr. Jenner Weir has reason to believe, hybrids are sometimes the result of the casual intercourse of birds building in close proximity. But these remarks do not apply to the many recorded instances of tamed or domestic birds, belonging to distinct species, which have become absolutely fascinated with each other, although living with their own species. Thus Waterton[18] states that out of a flock of twenty-three Canada geese, a female paired with a solitary Bernicle gander, although so different in appearance and size; and they produced hybrid offspring. A male Wigeon (*Mareca penelope*), living with females of the same species, has been known to pair with a Pintail duck, *Querquedula acuta.* Lloyd describes the remarkable attachment between a shield-drake (*Tadorna vulpanser*) and a common duck. Many additional instances could be given; and the Rev. E. S. Dixon remarks that "those who have kept many different species of geese together, well know what unaccountable attachments they are frequently forming, and that they are quite as likely to pair and rear young with individuals of a race (species) apparently the most alien to themselves, as with their own stock."

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[15] On the ornamented nests of humming-birds, Gould, 'Introduction to the Trochilidæ, 1861, p. 19. On the bower-birds, Gould, 'Hand-book to the Birds of Australia,' 1865, vol. i. pp. 444–461. Mr. Ramsay in the 'Ibis,' 1867, p. 456.

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[16] 'Hist. of British Birds,' vol. ii. p. 92.

[17] 'Zoologist,' 1853–1854, p. 3946.

[18] Waterton, 'Essays on Nat. Hist.' 2d series, pp. 42, 117. For the following statements, see, on the wigeon, Loudon's 'Mag. of Nat. Hist.' vol. ix. p. 616; L. Lloyd, 'Scandinavian Adventures,' vol. i. 1854, p. 452; Dixon, 'Ornamental and Domestic Poultry,' p. 137; Hewitt, in 'Journal of Horticulture,' Jan. 13, 1863, p. 40; Bechstein, 'Stubenvögel,' 1840, s. 230.

The Rev. W. D. Fox informs me that he possessed at the same time a pair of Chinese geese (*Anser cygnoides*), and a common gander with three geese. The two lots kept quite separate, until the Chinese gander seduced one of the common geese to live with him. Moreover, of the young birds hatched from the eggs of the common geese, only four were pure, the other eighteen proving hybrids; so that the Chinese gander seems to have had prepotent charms over the common gander. I will give only one other case; Mr. Hewitt states that a wild-duck, reared in captivity, "after breeding a couple of seasons with her own mallard, at once shook him off on my placing a male Pintail on the water. It was evidently a case of love at first sight, for she swam about the new-comer caressingly, though he appeared evidently alarmed and averse to her overtures of affection. From that hour she forgot her old partner. Winter passed by, and the next spring the Pintail seemed to have become a convert to her blandishments, for they nested and produced seven or eight young ones."

What the charm may have been in these several cases, beyond mere novelty, we cannot even conjecture. Color, however, sometimes comes into play; for in order to raise hybrids from the siskin (*Fringilla spinus*) and the canary, it is much the best plan, according to Bechstein, to place birds of the same tint together. Mr. Jenner Weir turned a female canary into his aviary, where there were male linnets, goldfinches, siskins, greenfinches, chaffinches, and other birds, in order to see which she would choose; but there never was any doubt, and the greenfinch carried the day. They paired and produced hybrid offspring.

With the members of the same species the fact of the female preferring to pair with one male rather than with another is not so likely to excite attention, as when this occurs between distinct species. Such cases can best be observed with domesticated or confined birds; but these are often pampered by high feeding, and sometimes have their instincts vitiated to an extreme degree. Of this latter fact I could give sufficient proofs with pigeons, and especially with fowls, but they cannot be here related. Vitiated instincts may also account for some of the hybrid unions above referred to; but in many of these cases the birds were allowed to range freely over large ponds, and there is no reason to suppose that they were unnaturally stimulated by high feeding.

With respect to birds in a state of nature, the first and most obvious supposition which will occur to every one is that the female at the proper season accepts the first male whom she may encounter; but she has at least the opportunity for exerting a choice, as she is almost invariably pursued by many males. Audubon—and we must remember that he spent a long life in prowling about the forests of the United States and observing the birds—does not doubt that the female deliberately chooses her mate: thus, speaking of a woodpecker, he says the hen is followed by half a dozen gay suitors, who continue performing strange antics, "until a marked preference is shown for one." The female of the red-winged starling (*Agelæus phœniceus*) is likewise pursued by several males, "until, becoming fatigued, she alights, receives their addresses, and soon makes a choice." He describes also how several male night-jars repeatedly plunge through the air with astonishing rapidity, suddenly turning, and thus making a singular noise; "but no sooner has the female made her choice, than the other males are driven away." With one of the vultures (*Cathartes aura*) of the United States, parties of eight or ten or more males and females assemble on fallen logs, "exhibiting the strongest desire to please mutually," and after many caresses, each male leads off his partner on the wing. Audubon likewise carefully observed the wild flocks of Canada geese (*Anser Canadensis*), and gives a graphic description of their love-antics; he says that the birds which had been previously mated "renewed their courtship as early as the month of January, while the others would be contending or coquetting for hours every day, until all seemed satisfied with the choice they had made, after which, although they remained together, any person could easily perceive that they were careful to keep in pairs. I have observed also that the older the birds, the shorter were the preliminaries of their courtship. The bachelors and old maids, whether in regret or not caring to be disturbed by the bustle, quietly moved aside and lay down at some distance from the rest."[19] Many similar statements with respect to other birds could be cited from this same observer.

Turning now to domesticated and confined birds, I will commence by giving what little I have learned respecting the courtship of fowls. I have received long letters on this subject from Messrs. Hewitt and Tegetmeier, and almost an essay from the late Mr. Brent. It will be admitted by every one that these gentlemen, so well known from their published works, are careful and experienced observers. They do not believe that the females prefer certain males on account of the beauty of their plumage; but some allowance must be made for the artificial state under which they have long been kept. Mr. Tegetmeier is convinced that a game-cock, though disfigured by being dubbed with his hackles trimmed, would be accepted as readily as a male retaining all his natural ornaments. Mr. Brent, however, admits that the beauty of the male probably aids in exciting the female; and her acquiescence is necessary. Mr. Hewitt is convinced that the union is by no means left to mere chance, for the female almost invariably prefers the most vigorous, defiant, and mettlesome male; hence it is almost useless, as he remarks, "to attempt true breeding if a game-cock in good health and condition runs the locality, for almost every hen on leaving the roosting-place will resort to the game-cock, even though that bird may not actually drive away the male of her own variety." Under ordinary circumstances the males and females of the fowl seem to come to a mutual understanding by means of certain gestures, described to me by Mr. Brent. But hens will often avoid the officious attentions of young males. Old hens, and hens of a pugnacious disposition, as the same writer informs me, dislike strange males, and will not yield until well beaten into compliance. Ferguson, however, describes how a quarrelsome hen was subdued by the gentle courtship of a Shanghai cock.[20]

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[19] Audubon, 'Ornitholog. Biography,' vol. i. pp. 191, 349; vol. ii. pp. 42, 275; vol. iii. p. 2.

There is reason to believe that pigeons of both sexes prefer pairing with birds of the same breed; and dovecot-pigeons dislike all the highly improved breeds.[21] Mr. Harrison Weir has lately heard from a trustworthy observer, who keeps blue pigeons, that these drive away all other colored varieties, such as white, red, and yellow; and from another observer, that a female dun carrier could not be matched, after repeated trials, with a black male, but immediately paired with a dun. Generally color alone appears to have little influence on the pairing of pigeons. Mr. Tegetmeier, at my request, stained some

[20] 'Rare and Prize Poultry,' 1854, p. 27.

[21] 'The Variation of Animals and Plants under Domestication,' vol. ii, p. 103.

of his birds with magenta, but they were not much noticed by the others.

Female pigeons occasionally feel a strong antipathy toward certain males, without any assignable cause. Thus MM. Boitard and Corbié, whose experience extended over forty-five years, state: "Quand une femelle éprouve de l'antipathie pour un mâle avec lequel on veut l'accoupler, malgré tous les feux de l'amour, malgré l'alpiste et le chènevis dont on la nourrit pour augmenter son ardeur, malgré un emprisonnement de six mois et même d'un an, elle refuse constamment ses caresses; les avances empressées, les agaceries, les tournoiemens, les tendres roucoulemens, rien ne peut lui plaire ni l'émouvoir; gonflée boudeuse, blottie dans un coin de sa prison, elle n'en sort que pour boire et manger, ou pour repousser avec une espèce de rage des caresses devenues trop pressantes."[22] On the other hand, Mr. Harrison Weir has himself observed, and has heard from several breeders, that a female pigeon will occasionally take a strong fancy for a particular male, and will desert her own mate for him. Some females, according to another experienced observer, Riedel,[23] are of a profligate disposition, and prefer almost any stranger to their own mate. Some amorous males, called by our English fanciers "gay birds," are so successful in their gallantries, that, as Mr. H. Weir informs me, they must be shut up, on account of the mischief which they cause.

Wild-turkeys in the United States, according to Audubon, "sometimes pay their addresses to the domesticated females, and are generally received by them with great pleasure." So that these females apparently prefer the wild to their own males.[24]

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[22] Boitard and Corbié, 'Les Pigeons,' 1824, p. 12. Prosper Lucas ('Traité de l'Héréd. Nat.' tome ii. 1850, p. 296) has himself observed nearly similar facts with pigeons.

[23] 'Die Taubenzucht,' 1824, s. 86.

Here is a more curious case. Sir R. Heron during many years kept an account of the habits of the peafowl, which he bred in large numbers. He states that "the hens have frequently great preference to a particular peacock. They were all so fond of an old pied cock, that one year, when he was confined though still in view, they were constantly assembled close to the trellis-walls of his prison, and would not suffer a japanned peacock to touch them. On his being let out in the autumn, the oldest of the hens instantly courted him, and was successful in her courtship. The next year he was shut up in a stable, and then the hens all courted his rival."[25] This rival was a japanned or black-winged peacock, which to our eyes is a more beautiful bird than the common kind.

Lichtenstein, who was a good observer and had excellent opportunities of observation at the Cape of Good Hope, assured Rudolphi that the female widow-bird (*Chera progne*) disowns the male, when robbed of the long tail-feathers with which he is ornamented during the breeding-season. I presume that this observation must have been made on birds under confinement.[26] Here is another striking case; Dr. Jaeger,[27] director of the Zoological Gardens of Vienna, states that a male silver-pheasant, who had been triumphant over the other males and was the accepted lover of the females, had his ornamental plumage spoiled. He was then immediately superseded by a rival, who got the upper hand and afterward led the flock.

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[24] 'Ornithological Biography,' vol. i. p. 13.

[25] 'Proc. Zool. Soc.' 1835, p. 54. The japanned peacock is considered by Mr. Sclater as a distinct species, and has been named *Pavo nigripennis.*

[26] Rudolphi, 'Beyträge zur Anthropologie,' 1812, s. 184.

[27] 'Die Darwin'sche Theorie, und ihre Stellung zu Moral und Religion, 1869, s 59.

Not only does the female exert a choice, but in some few cases she courts the male, or even fights for his possession. Sir R. Heron states that, with peafowl, the first advances are always made by the female; something of the same kind takes place, according to Audubon, with the older females of the wild-turkey. With the capercailzie, the females flit round the male, while he is parading at one of the places of assemblage, and solicit his attention.[28] We have seen that a tame wild-duck seduced after a long courtship an unwilling Pintail drake. Mr. Bartlett believes that the Lophophorus, like many other gallinaceous birds, is naturally polygamous, but two females cannot be placed in the same cage with a male, as they fight so much together. The following instance of rivalry is more surprising as it relates to bullfinches, which usually pair for life. Mr. Jenner Weir introduced a dull-colored and ugly female into his aviary, and she immediately attacked another mated female so unmercifully that the latter had to be separated. The new female did all the courtship, and was at last successful, for she paired with the male; but after a time she met with a just retribution, for, ceasing to be pugnacious, Mr. Weir replaced the old female, and the male then deserted his new and returned to his old love.

In all ordinary cases the male is so eager that he will accept any female, and does not, as far as we can judge, prefer one to the other; but exceptions to this rule, as we shall hereafter see, apparently occur in some few groups. With domesticated birds, I have heard of only one case in which the males show any preference for particular females, namely, that of the domestic cock, who, according to the high authority of Mr. Hewitt, prefers the younger to the older hens. On the other hand, in effecting hybrid unions between the male pheasant and common hens, Mr. Hewitt is convinced that the pheasant invariably prefers the older birds. He does not appear to be in the least influenced by their color, but is most "capricious in his attachments."[29] From some inexplicable cause he shows the most determined aversion to certain hens, which no care on the part of the breeder can overcome. Some hens, as Mr. Hewitt informs me, are quite unattractive even to the males of their own species, so that they may be kept with several cocks during a whole season, and not one egg out of forty or fifty will prove fertile. On the other hand, with the Long-tailed duck (*Harelda glacialis*), "it has been remarked," says M. Ekström, "that certain females are much more courted than the rest. Frequently, indeed, one sees an individual surrounded by six or eight amorous males." Whether this statement is credible, I know not; but the native sportsmen shoot these females in order to stuff them as decoys.[30]

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[28] In regard to peafowl, see Sir R. Heron, 'Proc. Zoolog. Soc.' 1835, p. 54, and the Rev. E. S. Dixon, 'Ornamental Poultry,' 1848, p. 8. For the turkey, Audubon, ibid. p. 4. For the capercailzie, Lloyd, 'Game-Birds of Sweden,' 1867, p. 23.

With respect to female birds feeling a preference for particular males, we must bear in mind that we can judge of choice being exerted, only by placing ourselves in imagination in the same position. If an inhabitant of another planet were to behold a number of young rustics at a fair, courting and quarrelling over a pretty girl, like birds at one of their places of assemblage, he would be able to infer that she had the power of choice only by observing the eagerness of the wooers to please her, and to display their finery. Now with birds, the evidence stands thus; they have acute powers of observation, and they

[29] Mr. Hewitt, quoted in 'Tegetmeier's Poultry-Book,' 1866, p. 165.

[30] Quoted in Lloyd's 'Game-Birds of Sweden,' p. 345.

seem to have some taste for the beautiful both in color and sound. It is certain that the females occasionally exhibit, from unknown causes, the strongest antipathies and preferences for particular males. When the sexes differ in color or in other ornaments, the males with rare exceptions are the most highly decorated, either permanently or temporarily during the breeding-season. They sedulously display their various ornaments, exert their voices, and perform strange antics in the presence of the females. Even well-armed males, who, it might have been thought, would have altogether depended for success on the law of battle, are in most cases highly ornamented; and their ornaments have been acquired at the expense of some loss of power. In other cases ornaments have been acquired, at the cost of increased risk from birds and beasts of prey. With various species many individuals of both sexes congregate at the same spot, and their courtship is a prolonged affair. There is even reason to suspect that the males and females within the same district do not always succeed in pleasing each other and pairing.

What, then, are we to conclude from these facts and considerations? Does the male parade his charms with so much pomp and rivalry for no purpose? Are we not justified in believing that the female exerts a choice, and that she receives the addresses of the male who pleases her most? It is not probable that she consciously deliberates; but she is most excited or attracted by the most beautiful, or melodious, or gallant males. Nor need it be supposed that the female studies each stripe or spot of color; that the peahen, for instance, admires each detail in the gorgeous train of the peacock—she is probably struck only by the general effect. Nevertheless, after hearing how carefully the male Argus pheasant displays his elegant primary wing-feathers, and erects his ocellated plumes in the right position for their full effect; or again, how the male goldfinch alternately displays his gold-bespangled wings, we ought not to feel too sure that the female does not attend to each detail of beauty. We can judge, as already remarked, of choice being exerted, only from the analogy of our own minds; and the mental powers of birds, if reason be excluded, do not fundamentally differ from ours. From these various considerations we may conclude that the pairing of birds is not left to chance; but that those males, which are best able by their various charms to please or excite the female, are under ordinary circumstances accepted. If this be admitted, there is not much difficulty in understanding how male birds have gradually acquired their ornamental characters. All animals present individual differences, and as man can modify his domesticated birds by selecting the individuals which appear to him the most beautiful, so the habitual or even occasional preference by the female of the more attractive males would almost certainly lead to their modification; and such modifications might in the course of time be augmented to almost any extent, compatible with the existence of the species.

Variability of Birds, and especially of their Secondary Sexual Characters.—Variability and inheritance are the foundations for the work of selection. That domesticated birds have varied greatly, ther variations being inherited, is certain. That birds in a state of nature present individual differences is admitted by every one; and that they have sometimes been modified into distinct races, is generally admitted.[31] Variations are of two kinds, which insensibly graduate into each other, namely, slight differences between all the members of the same species, and more strongly-marked deviations which occur only occasionally. These latter are rare with birds in a state of nature, and it is very doubtful whether they have often been preserved through selection, and then transmitted to succeeding generations.[32] Nevertheless, it may be worth while to give the few cases relating chiefly to color (simple albinism and melanism being excluded), which I have been able to collect.

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[31] According to Dr. Blasius ('Ibis,' vol. ii. 1860, p. 297), there are 425 indubitable species of birds which breed in Europe, besides 60 forms, which are frequently regarded as distinct species. Of the latter, Blasius thinks that only 10 are really doubtful, and that the other 50 ought to be united with their nearest allies; but this shows that there must be a considerable amount of variation with some of our European

Mr. Gould is well known rarely to admit the existence of varieties, for he esteems very slight differences as specific; now he states[33] that near Bogota certain humming-birds belonging to the genus Cynanthus are divided into two or three races or varieties, which differ from each other in the coloring of the tail—"some having the whole of the feathers blue, while others have the eight central ones tipped with beautiful green." It does not appear that intermediate gradations have been observed in this

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birds. It is also an unsettled point with naturalists, whether several North American birds ought to be ranked as specifically distinct from the corresponding European species.

[32] 'Origin of Species,' fifth edit. 1869, p. 104. I had always perceived that rare and strongly-marked deviations of structure, deserving to be called monstrosities, could seldom be preserved through natural selection, and that the preservation of even highly-beneficial variations would depend to a certain extent on chance. I had also fully appreciated the importance of mere individual differences, and this led me to insist so strongly on the importance of that unconscious form of selection by man, which follows from the preservation of the most valued individuals of each breed, without any intention on his part to modify the characters of the breed. But until I read an able article in the 'North British Review' (March, 1867, p. 289, *et seq.*), which has been of more use to me than any other Review, I did not see how great the chances were against the preservation of variations, whether slight or strongly pronounced, occurring only in single individuals.

[33] 'Introduct. to the Trochilidæ,' p. 102.

or the following cases. In the males alone of one of the Australian parrakeets "the thighs in some are scarlet, in others grass-green." In another parrakeet of the same country "some individuals have the band across the wing-coverts bright-yellow, while in others the same part is tinged with red."[34] In the United States some few of the males of the Scarlet Tanager (*Tanagra rubra*) have "a beautiful transverse band of glowing red on the smaller wing-coverts;"[35] but this variation seems to be somewhat rare, so that its preservation through sexual selection would follow only under unusually favorable circumstances. In Bengal the Honey buzzard (*Pernis cristata*) has either a small rudimental crest on its head, or none at all; so slight a difference, however, would not have been worth notice, had not this same species possessed in Southern India "a well-marked occipital crest formed of several graduated feathers."[36]

The following case is in some respects more interesting: A pied variety of the raven, with the head, breast, abdomen, and parts of the wings and tail-feathers white, is confined to the Feroe Islands. It is not very rare there, for Graba saw during his visit from eight to ten living specimens. Although the characters of this variety are not quite constant, yet it has been named by several distinguished ornithologists as a distinct species. The fact of the pied birds being pursued and persecuted with much clamor by the other ravens of the island was the chief cause which led Brünnich to conclude that it was specifically distinct; but this is now known to be an error.[37]

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[34] Gould, 'Hand-book of Birds of Australia,' vol. ii. pp. 32, 68.

[35] Audubon, 'Ornitholog. Biography,' 1838, vol. iv. p. 389.

[36] Jerdon, 'Birds of India,' vol. i. p. 108; and Mr. Blyth, in 'Land and Water,' 1868, p. 381.

[37] Graba, 'Tagebuch, Reise nach Färo,' 1830, s. 51–54. Macgillivray 'Hist. British Birds,' vol. iii. p. 745. 'Ibis,' vol. v. 1863, p. 469.

In various parts of the northern seas a remarkable variety of the common Guillemot (*Uria troile*) is found; and in Feroe, one out of every five birds, according to Graba's estimation, consists of this variety. It is characterized[38] by a pure white ring round the eye, with a curved narrow white line, an inch and a half in length, extending back from the ring. This conspicuous character has caused the bird to be ranked by several ornithologists as a distinct species under the name of *U. lacrymans*, but it is now known to be merely a variety. It often pairs with the common kind, yet intermediate gradations have never been seen; nor is this surprising, for variations which appear suddenly are often, as I have elsewhere shown,[39] transmitted either unaltered or not at all. We thus see that two distinct forms of the same species may coexist in the same district, and we cannot doubt that if the one had possessed any great advantage over the other, it would soon have been multiplied to the exclusion of the latter. If, for instance, the male pied ravens, instead of being persecuted and driven away by their comrades, had been highly attractive, like the pied peacock before mentioned, to the common black females, their numbers would have rapidly increased. And this would have been a case of sexual selection.

With respect to the slight individual differences which are common, in a greater or less degree, to all the members of the same species, we have every reason to believe that they are by far the most important for the work of selection. Secondary sexual characters are eminently liable to vary, both with animals in a state of nature and under domestication.[40] There is also reason to believe, as we have seen in our eighth chapter, that variations are more apt to occur in the male than in the female sex. All these contingencies are highly favorable for sexual selection. Whether characters thus acquired are transmitted to one sex or to both sexes, depends exclusively in most cases, as I hope to show in the following chapter, on the form of inheritance which prevails in the groups in question.

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[38] Graba, ibid. s. 54. Macgillivray, ibid. vol. v. p. 327.

[39] 'Variation of Animals and Plants under Domestication,' vol. ii p. 92.

[40] On these points see also 'Variation of Animals and Plants under Domestication,' vol. i. p. 253; vol. ii. pp. 73, 75.

It is sometimes difficult to form any opinion whether certain slight differences between the sexes of birds are simply the result of variability with sexually-limited inheritance, without the aid of sexual selection, or whether they have been augmented through this latter process. I do not here refer to the innumerable instances in which the male displays splendid colors or other ornaments, of which the female partakes only to a slight degree; for these cases are almost certainly due to characters primarily acquired by the male, having been transferred, in a greater or less degree, to the female. But what are we to conclude with respect to certain birds in which, for instance, the eyes differ slightly in color in the two sexes?[41] In some cases the eyes differ conspicuously; thus with the storks of the genus *Xenorhynchus* those of the male are blackish-hazel, while those of the females are gamboge-yellow; with many hornbills (Buceros), as I hear from Mr. Blyth,[42] the males have intense crimson, and the females white eyes. In the *Buceros bicornis*, the hind margin of the casque and a stripe on the crest of the beak are black in the male, but not so in the female. Are we to suppose that these black marks and the crimson color of the eyes have been preserved or augmented through sexual selection in the males? This is very doubtful; for Mr. Bartlett showed me in the Zoological Gardens that

[41] See, for instance, on the irides of a Podica and Gallicrex in 'Ibis,' vol. ii. 1860, p. 206; and vol. v. 1863, p. 426.

[42] See also Jerdon, 'Birds of India,' vol. i. pp. 243–245.

the inside of the mouth of this Buceros is black in the male and flesh-colored in the female; and their external appearance of beauty would not be thus affected. I observed in Chili[43] that the iris in the condor, when about a year old, is dark-brown, but changes at maturity into yellowish-brown in the male, and into bright red in the female. The male has also a small, longitudinal, leaden-colored, fleshy crest or comb. With many gallinaceous birds the comb is highly ornamental, and assumes vivid colors during the act of courtship; but what are we to think of the dull-colored comb of the condor, which does not appear to us in the least ornamental? The same question may be asked in regard to various other characters, such as the knob on the base of the beak of the Chinese goose (*Anser cygnoides*), which is much larger in the male than in the female. No certain answer can be given to these questions; but we ought to be cautious in assuming that knobs and various fleshy appendages cannot be attractive to the female, when we remember that with savage races of man various hideous deformities—deep scars on the face with the flesh raised into protuberances, the septum of the nose pierced by sticks or bones, holes in the ears and lips stretched widely open—are all admired as ornamental.

Whether or not unimportant differences between the sexes, such as those just specified, have been preserved through sexual selection, these differences, as well as all others, must primarily depend on the laws of variation. On the principle of correlated development, the plumage often varies on different parts of the body, or over the whole body, in the same manner. We see this well illustrated in certain breeds of the fowl. In all the breeds the feathers on the neck and loins of the males are elongated, and are called hackles; now when both sexes acquire a top-knot, which is a new character in the genus, the feathers on the head of the male become hackle-shaped, evidently on the principle of correlation; while those on the head of the female are of the ordinary shape. The color also of the hackles forming the top-knot of the male, is often correlated with that of the hackles on the neck and loins, as may be seen by comparing these feathers in the Golden and Silver-spangled Polish, the Houdans, and Crève-cœur breeds. In some natural species we may observe exactly the same correlation in the colors of these same feathers, as in the males of the splendid Golden and Amherst pheasants.

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[43] 'Zoology of the Voyage of H. M. S. Beagle,' 1841, p. 6.

The structure of each individual feather generally causes any change in its coloring to be symmetrical; we see this in the various laced, spangled, and pencilled breeds of the fowl; and on the principle of correlation the feathers over the whole body are often modified in the same manner. We are thus enabled without much trouble to rear breeds with their plumage marked and colored almost as symmetrically as in natural species. In laced and spangled fowls the colored margins of the feathers are abruptly defined; but in a mongrel raised by me from a black Spanish cock glossed with green and a white game hen, all the feathers were greenish-black, excepting toward their extremities, which were yellowish-white; but between the white extremities and the black bases, there was on each feather a symmetrical, curved zone of dark-brown. In some instances the shaft of the feather determines the distribution of the tints; thus with the body-feathers of a mongrel from the same black Spanish cock and a silver-spangled Polish hen, the shaft, together with a narrow space on each side, was greenish-black, and this was surrounded by a regular zone of dark-brown, edged with brownish-white. In these cases we see feathers becoming symmetrically shaded, like those which give so much elegance to the plumage of many natural species. I have also noticed a variety of the common pigeon with the wing-bars symmetrically zoned with three bright shades, instead of being simply black on a slaty-blue ground, as in the parent-species.

In many large groups of birds it may be observed that the plumage is differently colored in each species, yet that certain spots, marks, or stripes, though likewise differently colored, are retained by all the species. Analogous cases occur with the breeds of the pigeon, which usually retain the two wing-bars, though they may be colored red, yellow, white, black, or blue, the rest of the plumage being of some wholly different tint. Here is a more curious case, in which certain marks are retained, though colored in almost an exactly reversed manner to what is natural; the aboriginal pigeon has a blue tail, with the terminal halves of the outer webs of the two outer tail-feathers white; now there is a sub-variety having a white instead of a blue tail, with precisely that small part black which is white in the parent-species.[44]

Formation and Variability of the Ocelli or Eye-like Spots on the Plumage of Birds.—As no ornaments are more beautiful than the ocelli on the feathers of various birds, on the hairy coats of some mammals, on the scales of reptiles and fishes, on the skin of amphibians, on the wings of many Lepidoptera and other insects, they deserve to be especially noticed. An ocellus consists of a spot within a ring of another color, like the pupil within the iris, but the central spot is often surrounded by additional concentric zones. The ocelli on the tail-coverts of the peacock offer a familiar example, as well as those on the wings of the peacock-butterfly (Vanessa). Mr. Trimen has given me a description of a South African moth

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[44] Bechstein, 'Naturgeschichte Deutschlands,' B. iv. 1795, s. 31, on a sub-variety of the Monck pigeon.

(*Gynanisa Isis*), allied to our Emperor moth, in which a magnificent ocellus occupies nearly the whole surface of each hinder wing; it consists of a black centre, including a semitransparent crescent-shaped mark, surrounded by successive ochre-yellow, black, ochre-yellow, pink, white, pink, brown, and whitish zones. Although we do not know the steps by which these wonderfully-beautiful and complex ornaments have been developed, the process at least with insects has probably been a simple one; for, as Mr. Trimen writes to me, "no characters of mere marking or coloration are so unstable in the Lepidoptera as the ocelli, both in number and size." Mr. Wallace, who first called my attention to this subject, showed me a series of specimens of our common meadow-brown butterfly (*Hipparchia Janira*) exhibiting numerous gradations from a simple minute black spot to an elegantly-shaded ocellus. In a South African butterfly (*Cyllo Leda*, Linn.) belonging to the same family, the ocelli are even still more variable. In some specimens (A, Fig. 52) large spaces on the upper surface of the wings are colored black, and include irregular white marks; and from this state a complete gradation can be traced into a tolerably perfect (A¹) ocellus, and this results from the contraction of the irregular blotches of color. In another series of specimens a gradation can be followed from excessively minute white dots, surrounded by a scarcely visible black line (B), into perfectly symmetrical and large ocelli (B¹).[45] In cases like these, the development of a perfect ocellus does not require a long course of variation and selection.

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[45] This woodcut has been engraved from a beautiful drawing, most kindly made for me by Mr. Trimen; see also his description of the wonderful amount of variation in the coloration and shape of the wings of this butterfly, in his 'Rhopalocera Africæ Australis,' p. 186. See also an interesting paper by the Rev. H. H. Higgins, on the origin of the ocelli in the Lepidoptera in the 'Quarterly Journal of Science,' July, 1868, p. 325.

With birds and many other animals it seems, from the comparison of allied species, to follow, that circular spots are often generated by the breaking up and contraction of stripes. In the Tragopan pheasant faint white lines in the female represent the beautiful white spots in the male;[46] and something of the same kind may be observed in the two sexes of the Argus pheasant. However this may be, appearances strongly favor the belief that, on the one hand, a dark spot is often formed by the coloring matter being drawn toward a central point from a surrounding zone, which is thus rendered lighter. And, on the other hand, that a white spot is often formed by the color being driven away from a central point, so that it accumulates in a surrounding darker zone. In either case an ocellus is the result. The coloring matter seems to be a nearly constant quantity, but is redistributed, either

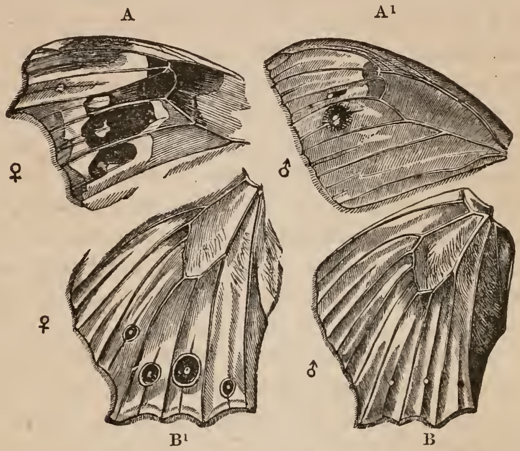

FIG. 52.—Cyllo leda, Linn., from a drawing by Mr. Trimen, showing the extreme range of variation in the ocelli.

A. Specimen, from Mauritius, upper surface of fore-wing.
A¹. Specimen, from Natal, ditto.
B. Specimen, from Java, upper surface of hind-wing.
B¹. Specimen, from Mauritius, ditto.

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[46] Jerdon, 'Birds of India,' vol. iii. p. 517.

centripetally or centrifugally. The feathers of the common guinea-fowl offer a good instance of white spots surrounded by darker zones; and whenever the white spots are large and stand near each other, the surrounding dark zones become confluent. In the same wing-feather of the Argus pheasant dark spots may be seen surrounded by a pale zone, and white spots by a dark zone. Thus the formation of an ocellus in its simplest state appears to be a simple affair. By what further steps the more complex ocelli, which are surrounded by many successive zones of color, have been generated, I will not pretend to say. But bearing in mind the zoned feathers of the mongrel offspring from differently-colored fowls, and the extraordinary variability of the ocelli in many Lepidoptera, the formation of these beautiful ornaments can hardly be a highly-complex process, and probably depends on some slight and graduated change in the nature of the tissues.

Gradation of Secondary Sexual Characters.—Cases of gradation are important for us, as they show that it is at least possible that highly-complex ornaments may have been acquired by small successive steps. In order to discover the actual steps by which the male of any existing bird has acquired his magnificent colors or other ornaments, we ought to behold the long line of his ancient and extinct progenitors; but this is obviously impossible. We may, however, generally gain a clew by comparing all the species of a group, if it be a large one; for some of them will probably retain, at least in a partial manner, traces of their former characters. Instead of entering on tedious details respecting various groups, in which striking instances of gradation could be given, it seems the best plan to take some one or two strongly-characterized cases, for instance that of the peacock, in order to discover if any light can thus be thrown on the steps by which this bird has become so splendidly decorated. The peacock is chiefly remarkable from the extraordinary length of his tail-coverts; the tail itself not being much elongated. The barbs along nearly the whole length of these feathers stand separate or are decomposed; but this is the case with the feathers of many species, and with some varieties of the domestic fowl and pigeon. The barbs coalesce toward the extremity of the shaft to form the oval disk or ocellus, which is certainly one of the most beautiful objects in the world. This consists of an iridescent, intensely blue, indented centre, surrounded by a rich green zone, and this by a broad coppery-brown zone, and this by five other narrow zones of slightly-different iridescent shades. A trifling character in the disk perhaps deserves notice; the barbs, for a space along one of the concentric zones are destitute, to a greater or less degree, of their barbules, so that a part of the disk is surrounded by an almost transparent zone, which gives to it a highly-finished aspect. But I have elsewhere described[47] an exactly analogous variation in the hackles of a sub-variety of the game-cock, in which the tips, having a metallic lustre, "are separated from the lower part of the feather by a symmetrically-shaped transparent zone, composed of the naked portions of the barbs." The lower margin or base of the dark-blue centre of the ocellus is deeply indented on the line of the shaft. The surrounding zones likewise show traces, as may be seen in the drawing (Fig. 53), of indentations, or rather breaks. These indentations are common to the Indian and Javan peacocks (*Pavo cristatus* and *P. muticus*); and they seemed to me to deserve particular attention, as probably connected with the development of the ocellus; but for a long time I could not conjecture their meaning.

If we admit the principle of gradual evolution, there must formerly have existed many species which presented every successive step between the wonderfully elongated tail-coverts of the peacock and the short tail-coverts of all ordinary birds; and again between the magnificent ocelli of the former, and the simpler ocelli or mere colored spots

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[47] 'Variation of Animals and Plants under Domestication,' vol. i. p. 254.

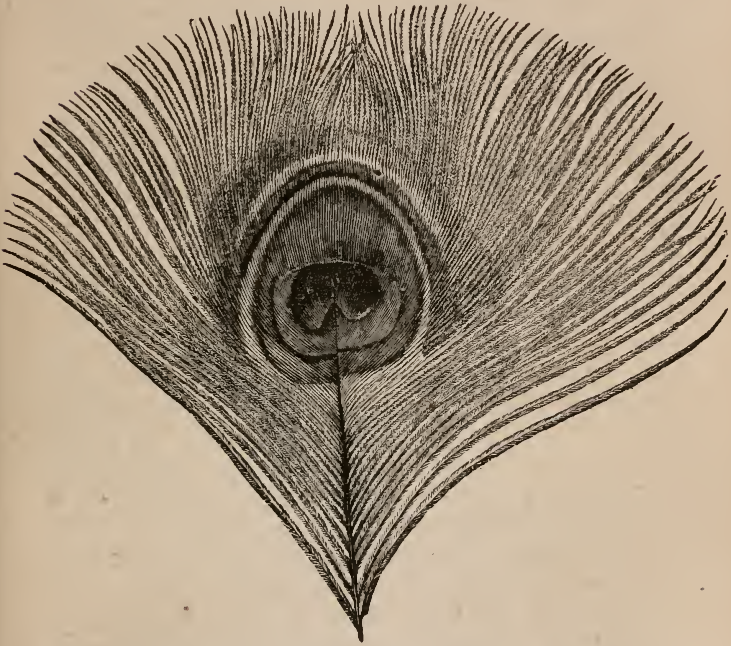

FIG. 53.—Feather of Peacock, about two-thirds of natural size, carefully drawn by Mr. Ford. The transparent zone is represented by the outermost white zone confined to the upper end of the disk.

of other birds; and so with all the other characters of the peacock. Let us look to the allied Gallinaceæ for any still-existing gradations. The species and sub-species of Polyplectron inhabit countries adjacent to the native land of the peacock; and they so far resemble this bird that they are sometimes called peacock-pheasants. I am also informed by Mr. Bartlett that they resemble the peacock in their voice and in some of their habits. During the spring the males, as previously described, strut about before the comparatively plain-colored females, expanding and erecting their tail and wing feathers, which are ornamented with numerous ocelli. I request the reader to turn back to the drawing (Fig. 51, p. 86) of a Polyplectron. In *P. Napoleonis* the ocelli are confined to the tail, and the back is of a rich metallic blue, in which respects this species approaches the Java peacock. *P. Hardwickii* possesses a peculiar top-knot, somewhat like that of this same kind of peacock. The ocelli on the wings and tail of the several species of Polyplectron are either circular or oval, and consist of a beautiful, iridescent, greenish-blue or greenish-purple disk, with a black border. This border in *P. chinquis* shades into brown which is edged with cream-color, so that the ocellus is here surrounded with differently, though not brightly, shaded concentric zones. The unusual length of the tail-coverts is another highly-remarkable character in Polyplectron; for in some of the species they are half as long, and in others two-thirds of the length of the true tail-feathers. The tail-coverts are ocellated, as in the peacock. Thus the several species of Polyplectron manifestly make a graduated approach in the length of their tail-coverts, in the zoning of the ocelli, and in some other characters, to the peacock.

Notwithstanding this approach, the first species of Polyplectron which I happened to examine almost made me give up the search; for I found not only that the true tail-feathers, which in the peacock are quite plain, were ornamented with ocelli, but that the ocelli on all the feathers differed fundamentally from those of the peacock, in there being two on the same feather (Fig. 54), one on each side of the shaft. Hence I concluded that the early progenitors of the peacock could not have resembled in any degree a Polyplectron. But on continuing my search, I observed that in some of the species the two ocelli stood very near each other; that in the tail-feathers of *P. Hardwickii* they touched each other; and, finally, that in the tail-coverts of this same species as well as of *P. malaccense* (Fig. 55) they were actually confluent. As the central part alone is confluent, an indentation is left at both the upper and lower ends; and the surrounding colored zones are likewise indented. A single ocellus is thus formed on each tail-covert, though still plainly betraying its double origin. These confluent ocelli differ from the single ocelli of the peacock in having an indentation at both ends, instead of at the lower or basal end alone. The explanation, however, of this difference is not difficult; in some species of Polyplectron the two oval ocelli on the same feather stand parallel to each other; in other species (as in *P. chinquis*) they converge toward one end; now the partial confluence of two

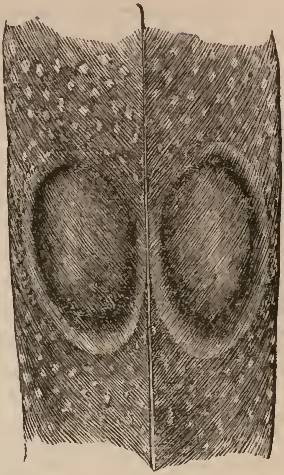

FIG. 54.—Part of a tail-covert of Poly plectron chinquis, with the two ocelli of natural size.

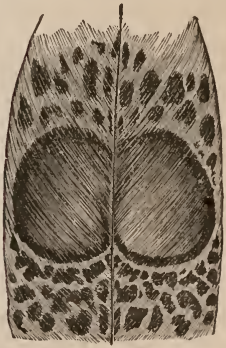

FIG. 55.—Part of a tail-covert of Polyplectron malaccense, with the two ocelli, partially confluent, of natural size.

convergent ocelli would manifestly leave a much deeper indentation at the divergent than at the convergent end. It is also manifest that, if the convergence were strongly pronounced and the confluence complete, the indentation at the convergent end would tend to be quite obliterated.

The tail-feathers in both species of peacock are entirely destitute of ocelli, and this apparently is related to their being covered up and concealed by the long tail-coverts. In this respect they differ remarkably from the tail-feathers of Polyplectron, which in most of the species are ornamented with larger ocelli than those on the tail-coverts. Hence I was led carefully to examine the tail-feathers of the several species of Polyplectron, in order to discover whether the ocelli in any of them showed any tendency to disappear, and, to my great satisfaction, I was successful. The central tail-feathers of *P. Napoleonis* have the two ocelli on each side of the shaft perfectly developed; but the inner ocellus becomes less and less conspicuous on the more exterior tail-feathers, until a mere shadow or rudimentary vestige is left on the inner side of the outermost feather. Again, in *P. malaccense*, the ocelli on the tail-coverts are, as we have seen, confluent; and these feathers are of unusual length, being two-thirds of the length of the tail-feathers, so that in both these respects they resemble the tail-coverts of the peacock. Now in this species the two central tail-feathers alone are ornamented, each with two brightly-colored ocelli, the ocelli having completely disappeared from the inner sides of all the other tail-feathers. Consequently the tail-coverts and tail-feathers of this species of Polyplectron make a near approach in structure and ornamentation to the corresponding feathers of the peacock.

As far, then, as the principle of gradation throws light on the steps by which the magnificent train of the peacock has been acquired, hardly any thing more is needed.

We may picture to ourselves a progenitor of the peacock in an almost exactly intermediate condition between the existing peacock, with his enormously elongated tail-coverts, ornamented with single ocelli, and an ordinary gallinaceous bird with short tail-coverts, merely spotted with some color; and we shall then see in our mind's eye a bird possessing tail-coverts, capable of erection and expansion, ornamented with two partially confluent ocelli, and long enough almost to conceal the tail-feathers—the latter having already partially lost their ocelli; we shall see, in short, a Polyplectron. The indentation of the central disk and surrounding zones of the ocellus in both species of peacock, seems to me to speak plainly in favor of this view; and this structure is otherwise inexplicable. The males of Polyplectron are no doubt very beautiful birds, but their beauty, when viewed from a little distance, cannot be compared, as I formerly saw in the Zoological Gardens, with that of the peacock. Many female progenitors of the peacock must, during a long line of descent, have appreciated this superiority; for they have unconsciously, by the continued preference of the most beautiful males, rendered the peacock the most splendid of living birds.

Argus Pheasant.—Another excellent case for investigation is offered by the ocelli on the wing-feathers of the Argus pheasant, which are shaded in so wonderful a manner as to resemble balls lying within sockets, and which consequently differ from ordinary ocelli. No one, I presume, will attribute the shading, which has excited the admiration of many experienced artists, to chance—to the fortuitous concourse of atoms of coloring matter. That these ornaments should have been formed through the selection of many successive variations, not one of which was originally intended to produce the ball-and-socket effect, seems as incredible, as that one of Raphael's Madonnas should have been formed by the selection of chance daubs of paint made by a long succession of young artists, not one of whom intended at first to draw the human figure. In order to discover how the ocelli have been developed, we cannot look to a long line of progenitors, nor to various closely-allied forms, for such do not now exist. But fortunately the several feathers on the wing suffice to give us a clew to the problem, and they prove to demonstration that a gradation is at least possible from a mere spot to a finished ball-and-socket ocellus.

The wing-feathers, bearing the ocelli, are covered with dark stripes or rows of dark spots, each stripe or row running obliquely down the outer side of the shaft to an ocellus. The spots are generally elongated in a transverse line to the row in which they stand. They often become confluent, either in the line of the row—and then they form a longitudinal stripe—or transversely, that is, with the spots in the adjoining rows, and then they form transverse stripes. A spot sometimes breaks up into smaller spots, which still stand in their proper places.

It will be convenient first to describe a perfect ball-and-socket ocellus. This consists of an intensely black circular ring, surrounding a space shaded so as exactly to resemble a ball. The figure here given has been admirably drawn by Mr. Ford, and engraved, but a woodcut cannot exhibit the exquisite shading of the original. The ring is almost always slightly broken or interrupted (see Fig. 56) at a point in the upper half, a little to the right of and above the white shade on the enclosed ball; it is also sometimes broken toward the base on the right hand. These little breaks have an important meaning. The ring is always much thickened, with the edges ill-defined toward the left-hand upper corner, the feather being held erect, in the position in which it is here drawn. Beneath this thickened part there is on the surface of the ball an oblique almost pure-white mark which shades off downward into a pale-leaden hue, and this into yellowish and brown tints, which insensibly become darker and darker toward the lower part of the ball. It is this shading, which gives so admirably the effect of light shining on a convex surface. If one of the balls be examined, it will be seen that the lower part is of a browner tint and is indistinctly separated by a curved oblique line from the upper part, which is yellower and more leaden; this oblique line runs at right angles to the longer axis of the white patch of light, and indeed of all the shading; but this difference in the tints, which cannot of course be shown in the woodcut, does not in the least interfere with the perfect shading of the ball.[48]

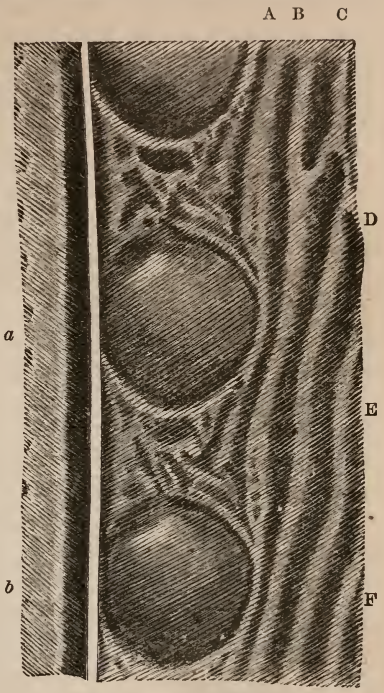

FIG. 56.—Part of Secondary wing-feather of Argus pheasant, showing two, *a* and *b*, perfect ocelli. A, B, C, etc., dark stripes running obliquely down, each to an ocellus. [Much of the web on both sides, especially to the left of the shaft, has been cut off].

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[48] When the Argus pheasant displays his wing-feathers like a great fan, those nearest to the body stand more upright than the outer ones,

It should be particularly observed that each ocellus stands in obvious connection with a dark stripe, or row of dark spots, for both occur indifferently on the same feather. Thus in Fig. 56 stripe A runs to ocellus *a*; B runs to ocellus *b*; stripe C is broken in the upper part and runs down to the next succeeding ocellus, not represented in the woodcut; D to the next lower one, and so with the stripes E and F. Lastly, the several ocelli are separated from each other by a pale surface bearing irregular black marks.

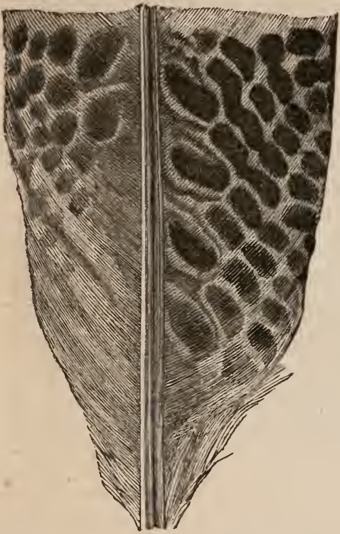

FIG. 57.—Basal part of the Secondary wing-feather, nearest to the body.

I will next describe the other extreme of the series, namely, the first trace of an ocellus. The short secondary wing-feather (Fig. 57), nearest to the body, is marked, like the other feathers, with oblique, longitudinal, rather irregular, rows of spots. The lowest spot, or that nearest the shaft, in the five lower rows (excluding the basal row) is a little larger than the other spots in the same

so that the shading of the ball-and-socket ocelli ought to be slightly different on the different feathers, in order to bring out their full effect, relatively to the incidence of the light. Mr. T. W. Wood, who has the experienced eye of an artist, asserts ('Field,' newspaper, May 28, 1870, p. 457) that this is the case; but after carefully examining two mounted specimens (the proper feathers from one having been given to me by Mr. Gould for more accurate comparison) I cannot perceive that this acme of perfection in the shading has been attained; nor can others to whom I have shown these feathers recognize the fact.

row, and a little more elongated in a transverse direction. It differs also from the other spots by being bordered on its upper side with some dull fulvous shading. But this spot is not in any way more remarkable than those on the plumage of many birds, and might easily be quite overlooked. The next higher spot in each row does not differ at all from the upper ones in the same row, although in the following series it becomes, as we shall see, greatly modified. The larger spots occupy exactly the same relative position on this feather as those occupied by the perfect ocelli on the longer wing-feathers.

By looking to the next two or three succeeding secondary wing-feathers, an absolutely insensible gradation can be traced from one of the above-described lower spots, together with the next higher one in the same row, to a curious ornament, which cannot be called an ocellus, and which I will name, from the want of a better term, an "elliptic ornament." These are shown in the accompanying figure (Fig. 58). We here see several oblique rows, A, B, C, D (see the lettered diagram), etc., of dark spots of the usual character. Each row of spots runs down to and is connected with one of the elliptic ornaments, in exactly the same manner as each stripe in Fig. 56 runs down to, and is connected with, one of the ball-and-socket ocelli. Looking to any one row, for instance, B, the lowest spot or mark (*b*) is thicker and considerably longer than the upper spots, and has its left extremity pointed and curved upward. This black mark is abruptly bordered on its upper side by a rather broad space of richly-shaded tints, beginning with a narrow brown zone, which passes into orange, and this into a pale leaden tint, with the end toward the shaft much paler. This mark corresponds in every respect with the larger, shaded spot, described in the last paragraph (Fig 57), but is more highly developed and more brightly colored. To the right and above this spot (*b*), with its bright shading, there is a long, narrow, black mark (*c*), belonging to the same row, and which is arched a little downward so as to face (*b*). It is also narrowly edged on the lower side with a fulvous tint. To the left of and above *c*, in the same oblique direction, but always more or less distinct from it, there is another black mark (*d*). This mark is generally sub-triangular and irregular in shape, but in the one lettered in the diagram is unusually narrow, elongated, and regular. It apparently consists of a lateral and broken prolongation of the mark (*c*), as I infer from traces of similar prolongations from the succeeding upper spots; but I do not feel sure of this.

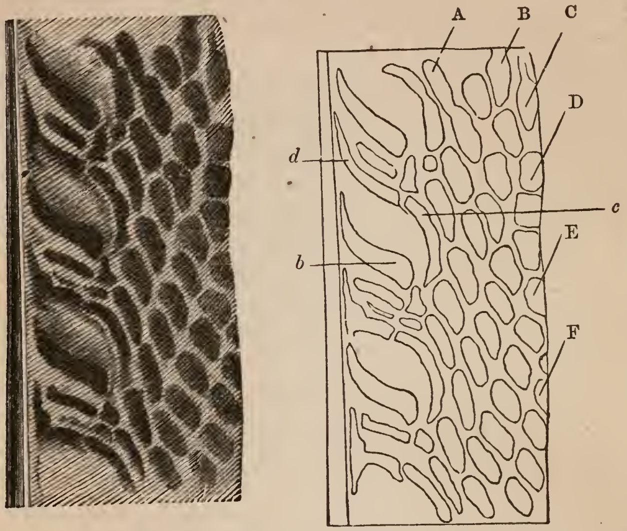

FIG. 58.—Portion of one of the Secondary wing-feathers near to the body; showing the so-called elliptic ornaments. The right-hand figure is given merely as a diagram for the sake of the letters of reference.

A, B, C, etc. Rows of spots running down to and forming the elliptic ornaments.
b. Lowest spot or mark in row B.
c. The next succeeding spot or mark in the same row.
d. Apparently a broken prolongation of the spot *c* in the same row B.

These three marks, *b*, *c*, and *d*, with the intervening bright shades, form together the so-called elliptic ornament. These ornaments stand in a line parallel to the shaft, and manifestly correspond in position with the ball-and-socket ocelli. Their extremely elegant appearance cannot be appreciated in the drawing, as the orange and leaden tints, contrasting so well with the black marks, cannot be shown.

Between one of the elliptic ornaments and a perfect ball-and-socket ocellus, the gradation is so perfect that it is scarcely possible to decide when the latter term ought to be used. I regret that I have not given an additional drawing, besides Fig. 58, which stands about half-way in the series between one of the simple spots and a perfect ocellus. The passage from the elliptic ornament into an ocellus is effected by the elongation and greater curvature in opposed directions of the lower black mark (*b*), and more especially of the upper one (*c*), together with the contraction of the irregular sub-triangular or narrow mark (*d*), so that at last these three marks become confluent, forming an irregular elliptic ring. This ring is gradually rendered more and more circular and regular, at the same time increasing in diameter. Traces of the junction of all three elongated spots or marks, especially of the two upper ones, can still be observed in many of the most perfect ocelli. The broken state of the black ring on the upper side of the ocellus in Fig. 56 was pointed out. The irregular sub-triangular or narrow mark (*d*) manifestly forms, by its contraction and equalization, the thickened portion of the ring on the left upper side of the perfect ball-and-socket ocellus. The lower part of the ring is invariably a little thicker than the other parts (see Fig. 56), and this follows from the lower black mark of the elliptic ornament (*b*) having been originally thicker than the upper mark (*c*). Every step can be followed in the process of confluence and modification; and the black-ring which surrounds the ball of the ocellus is unquestionably formed by the union and modification of the three black marks, *b*, *c*, *d*, of the elliptic ornament. The irregular zigzag black marks between the successive ocelli (see again Fig. 56) are plainly due to the breaking up of the somewhat more regular but similar marks between the elliptic ornaments.

The successive steps in the shading of the ball-and-socket ocelli can be followed out with equal clearness. The brown, orange, and pale-leaden narrow zones which border the lower black mark of the elliptic ornament can be seen gradually to become more and more softened and shaded into each other, with the upper lighter part toward the left-hand corner rendered still lighter, so as to become almost white. But even in the most perfect ball-and-socket ocelli a slight difference in the tints, though not in the shading, between the upper and lower parts of the ball can be perceived (as was before especially noticed), the line of separation being oblique, in the same direction with the bright-colored shades of the elliptic ornaments. Thus almost every minute detail in the shape and coloring of the ball-and-socket ocelli can be shown to follow from gradual changes in the elliptic ornaments; and the development of the latter can be traced by equally small steps from the union of two almost simple spots, the lower one (Fig. 57) having some dull fulvous shading on the upper side.

The extremities of the longer secondary feathers which bear the perfect ball-and-socket ocelli are peculiarly ornamented. (Fig. 59.) The oblique longitudinal stripes suddenly cease upward and become confused, and above this limit the whole upper end of the feather (*a*) is covered with white dots, surrounded by little black rings, standing on a dark ground. Even the oblique stripe belonging to the uppermost ocellus (*b*) is represented only by a very short irregular black mark with the usual, curved, transverse base. As this stripe is thus abruptly cut off above, we can understand, from what has gone before, how it is that the upper thickened part of the ring is absent in the uppermost ocellus; for, as before stated, this thickened part is apparently formed by a broken prolongation of the next higher spot in the same row. From the absence of the upper and thickened part of the ring, the uppermost ocellus, though perfect in all other respects, appears as if its top had been obliquely sliced off. It would, I think, perplex any one, who believes that the plumage of the Argus pheasant was created as we now see it, to account for the imperfect condition of the uppermost ocelli. I should add that in the secondary wing-feather farthest from the body all the ocelli are smaller and less perfect than on the other feathers, with the upper parts of the external black rings deficient, as in the case just mentioned. The imperfection here seems to be connected with the fact that the spots on this feather show less tendency than

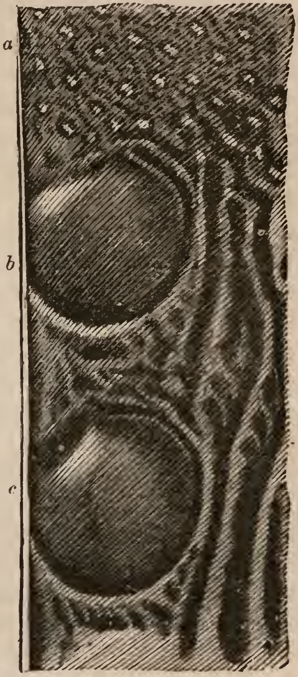

FIG. 59.—Portion near summit of one of the Secondary wing-feathers, bearing perfect ball-and-socket ocelli.

a. Ornamented upper part.
b. Uppermost, imperfect ball-and-socket ocellus. (The shading above the white mark on the summit of the ocellus is here a little too dark.)
c. Perfect ocellus.

usual to become confluent into stripes; on the contrary, they are often broken up into smaller spots, so that two or three rows run down to each ocellus.

We have now seen that a perfect series can be followed, from two almost simple spots, at first quite distinct from each other, to one of the wonderful ball-and-socket ornaments. Mr. Gould, who kindly gave me some of these feathers, fully agrees with me in the completeness of the gradation. It is obvious that the stages in development exhibited by the feathers on the same bird do not at all necessarily show us the steps which have been passed through by the extinct progenitors of the species; but they probably give us the clew to the actual steps, and they at least prove to demonstration that a gradation is possible. Bearing in mind how carefully the male Argus pheasant displays his plumes before the female, as well as the many facts rendering it probable that female birds prefer the more attractive males, no one who admits the agency of sexual selection will deny that a simple dark spot with some fulvous shading might be converted through the approximation and modification of the adjoining spots, together with some slight increase of color, into one of the so-called elliptic ornaments. These latter ornaments have been shown to many persons, and all have admitted that they are extremely pretty, some thinking them even more beautiful than the ball-and-socket ocelli. As the secondary plumes became lengthened through sexual selection, and as the elliptic ornaments increased in diameter, their colors apparently became less bright; and then the ornamentation of the plumes had to be gained by improvements in the pattern and shading; and this process has been carried on until the wonderful ball-and-socket ocelli have been finally developed. Thus we can understand—and in no other way, as it seems to me—the present condition and origin of the ornaments on the wing-feathers of the Argus pheasant.

From the light reflected by the principle of gradation; from what we know of the laws of variation; from the changes which have taken place in many of our domesticated birds; and, lastly, from the character (as we shall hereafter more clearly see) of the immature plumage of young birds—we can sometimes indicate, with a certain amount of confidence, the probable steps by which the males have acquired their brilliant plumage and various ornaments; yet in many cases we are involved in darkness. Mr. Gould several years ago pointed out to me a humming-bird, the *Urosticte benjamini*, remarkable from the curious differences presented by the two sexes. The male, besides a splendid gorget, has greenish-black tail-feathers, with the four *central* ones tipped with white; in the female, as with most of the allied species, the three *outer* tail-feathers on each side are tipped with white, so that the male has the four central, while the female has the six exterior feathers ornamented with white tips. What makes the case curious is that, although the coloring of the tail differs remarkably in both sexes of many kinds of humming-birds, Mr. Gould does not know a single species, besides the Urosticte, in which the male has the four central feathers tipped with white.

The Duke of Argyll, in commenting on this case,[49] passes over sexual selection, and asks, "What explanation does the law of natural selection give of such specific varieties as these?" He answers "none whatever;" and I quite agree with him. But can this be so confidently said of sexual selection? Seeing in how many ways the tail-feathers of humming-birds differ, why should not the four central feathers have varied in this one species alone so as to have aqcuired white tips? The variations may have been gradual, or somewhat abrupt as in the case recently given of the humming-birds near Bogota, in which certain individuals alone have the "central tail-feathers tipped with beautiful green." In the female of the Urosticte I noticed extremely minute or rudimental white tips to the two outer of the four central black tail-feathers; so that here we have an indication of change of some kind in the plumage of this species. If we grant the possibility of the central tail-feathers of the male varying in whiteness, there is nothing strange in such variations having been sexually selected. The white tips, together with the small white ear-tufts, certainly add, as the Duke of Argyll admits, to the beauty of the male; and whiteness is apparently appreciated by other birds, as may be inferred from such cases as the snow-white male of the Bell-bird. The statement made by Sir R. Heron should not be forgotten, namely, that his peahens, when debarred from access to the pied peacock, would not unite with any other male, and during that season produced no offspring. Nor is it strange that variations in the tail-feathers of the Urosticte should have been specially selected for the sake of ornament, for the next succeeding genus in the family takes its name of Metallura from the splendor of these feathers. Mr. Gould, after describing the peculiar plumage of the Urosticte, adds, "that ornament and variety is the sole object, I have myself but little doubt."[50] If this be admitted, we can perceive that the males which were decked in the most elegant and novel manner would have gained an advantage, not in the ordinary struggle for life, but in rivalry with other males, and would consequently have left a larger number of offspring to inherit their newly-acquired beauty.

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[49] 'The Reign of Law,' 1867, p. 247.

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[50] 'Introduction to the Trochilidæ' 1861, p. 110.

CHAPTER XV.

Birds—*continued.*

Discussion why the Males alone of some Species, and both Sexes of other Species, are brightly colored.—On Sexually-limited Inheritance, as applied to Various Structures and to Brightly-colored Plumage.—Nidification in Relation to Color.—Loss of Nuptial Plumage during the Winter.

We have in this chapter to consider, why with many kinds of birds the female has not received the same ornaments as the male; and why, with many others, both sexes are equally, or almost equally, ornamented? In the following chapter we shall consider why in some few rare cases the female is more conspicuously colored than the male.

In my 'Origin of Species'[1] I briefly suggested that the long tail of the peacock would be inconvenient, and the conspicuous black color of the male capercailzie dangerous, to the female during the period of incubation; and consequently that the transmission of these characters from the male to the female offspring had been checked through natural selection. I still think that this may have occurred in some few instances: but after mature reflection on all the facts which I have been able to collect, I am now inclined to believe that when the sexes differ, the successive variations have generally been from the first limited in their transmission to the same sex in which they first appeared. Since my remarks appeared, the subject of sexual coloration has been discussed in some very interesting papers by Mr. Wallace,[2] who believes that in almost all cases the successive variations tended at first to be transmitted equally to both sexes; but that the female was saved, through natural selection, from acquiring the conspicuous colors of the male, owing to the danger which she would thus have incurred during incubation.

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[1] Fourth edition, 1866, p. 241.

This view necessitates a tedious discussion on a difficult point, namely, whether the transmission of a character, which is at first inherited by both sexes, can be subsequently limited in its transmission, by means of selection, to one sex alone. We must bear in mind, as shown in the preliminary chapter on sexual selection, that characters which are limited in their development to one sex are always latent in the other. An imaginary illustration will best aid us in seeing the difficulty of the case: we may suppose that a fancier wished to make a breed of pigeons, in which the males alone should be colored of a pale blue, while the females retained their former slaty tint. As with pigeons characters of all kinds are usually transmitted to both sexes equally, the fancier would have to try to convert this latter form of inheritance into sexually-limited transmission. All that he could do would be to persevere in selecting every male pigeon which was in the least degree of a paler blue; and the natural result of this process, if steadily carried on for a long time, and if the pale variations were strongly inherited or often recurred, would be to make his whole stock of a lighter blue. But our fancier would be compelled to match, generation after generation, his pale-blue males with slaty females, for he wishes to keep the latter of this color. The result would generally be the production either of a mongrel piebald lot, or more probably the speedy and complete loss of the pale-blue color, for the primordial slaty tint would be transmitted with prepotent force. Supposing, however, that some pale-blue males and slaty females were produced during each successive generation, and were always crossed together; then the slaty females would have, if I may use the expression, much blue blood in their veins, for their fathers, grandfathers, etc., will all have been blue birds. Under these circumstances it is conceivable (though I know of no distinct facts rendering it probable) that the slaty females might acquire so strong a latent tendency to pale-blueness that they would not destroy this color in their male offspring, their female offspring still inheriting the slaty tint. If so, the desired end of making a breed with the two sexes permanently different in color might be gained.

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[2] 'Westminster Review,' July 1867 'Journal of Travel,' vol. i. 1868, p. 73.

The extreme importance, or rather necessity, of the desired character in the above case, namely, pale-blueness, being present though in a latent state in the female, so that the male offspring should not be deteriorated, will be best appreciated as follows: the male of Sœmmerring's pheasant has a tail thirty-seven inches in length, while that of the female is only eight inches; the tail of the male common pheasant is about twenty inches and that of the female twelve inches long. Now if the female Sœmmerring pheasant with her *short* tail were crossed with the male common pheasant, there can be no doubt that the male hybrid offspring would have a much *longer* tail than that of the pure offspring of the common pheasant. On the other hand, if the female common pheasant, with her tail nearly *twice as long* as that of the female Sœmmerring pheasant, were crossed with the male of the latter, the male hybrid offspring would have a much *shorter* tail than that of the pure offspring of Sœmmerring's pheasant.[3]

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[3] Temminck says that the tail of the female *Phasianus Sœmmerringii*

Our fancier, in order to make his new breed with the males of a decided pale-blue tint, and the females unchanged, would have to continue selecting the males during many generations; and each stage of paleness would have to be fixed in the males, and rendered latent in the females. The task would be an extremely difficult one, and has never been tried, but might possibly succeed. The chief obstacle would be the early and complete loss of the pale-blue tint, from the necessity of reiterated crosses with the slaty female, the latter not having at first any *latent* tendency to produce pale-blue offspring.

On the other hand, if one or two males were to vary ever so slightly in paleness, and the variations were from the first limited in their transmission to the male sex, the task of making a new breed of the desired kind would be easy, for such males would simply have to be selected and matched with ordinary females. An analogous case has actually occurred, for there are breeds of the pigeon in Belgium[4] in which the males alone are marked with black striæ. In the case of the fowl, variations of color limited in their transmission to the male sex habitually occur. Even when this form of inheritance prevails, it might well happen that some of the successive steps in the process of variation might be transferred to the female, who would then come to resemble in a slight degree the male, as occurs in some breeds of the fowl. Or again, the greater number, but not all, of the successive steps might be transferred to both sexes, and the female would then closely resemble the male. There can hardly be a doubt that this is the cause of the male pouter pigeon having a

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is only six inches long, 'Planches coloriées,' vol. v. 1838, pp. 478, 498: the measurements above given were made for me by Mr. Sclater. For the common pheasant, see Macgillivray, 'Hist. British Birds,' vol. i. pp. 118–121.

[4] Dr. Chapuis, 'Le Pigeon Voyageur Belge,' 1865, p. 87.

somewhat larger crop, and of the male carrier-pigeon having somewhat larger wattles, than their respective females; for fanciers have not selected one sex more than the other, and have had no wish that these characters should be more strongly displayed in the male than in the female, yet this is the case with both breeds.

The same process would have to be followed, and the same difficulties would be encountered, if it were desired to make a breed with the females alone of some new color.

Lastly, our fancier might wish to make a breed with the two sexes differing from each other, and both from the parent-species. Here the difficulty would be extreme, unless the successive variations were from the first sexually limited on both sides, and then there would be no difficulty. We see this with the fowl; thus the two sexes of the pencilled Hamburgs differ greatly from each other, and from the two sexes of the aboriginal *Gallus bankiva*; and both are now kept constant to their standard of excellence by continued selection, which would be impossible unless the distinctive characters of both were limited in their transmission. The Spanish fowl offers a more curious case; the male has an immense comb, but some of the successive variations, by the accumulation of which it was acquired, appear to have been transferred to the female; for she has a comb many times larger than that of the females of the parent-species. But the comb of the female differs in one respect from that of the male, for it is apt to lop over; and within a recent period it has been ordered by the fancy that this should always be the case, and success has quickly followed the order. Now, the lopping of the comb must be sexually limited in its transmission, otherwise it would prevent the comb of the male from being perfectly upright, which would be abhorrent to every fancier. On the other hand the uprightness of the comb in the male must likewise be a sexually-limited character, otherwise it would prevent the comb of the female from lopping over.

From the foregoing illustrations, we see that, even with almost unlimited time at command, it would be an extremely difficult and complex process, though perhaps not impossible, to change through selection one form of transmission into the other. Therefore, without distinct evidence in each case, I am unwilling to admit that this has often been effected with natural species. On the other hand, by means of successive variations, which were from the first sexually limited in their transmission, there would not be the least difficulty in rendering a male bird widely different in color or in any other character from the female; the latter being left unaltered, or slightly altered, or specially modified, for the sake of protection.

As bright colors are of service to the males in their rivalry with other males, such colors would be selected, whether or not they were transmitted exclusively to the same sex. Consequently the females might be expected often to partake of the brightness of the males to a greater or less degree; and this occurs with a host of species. If all the successive variations were transmitted equally to both sexes, the females would be undistinguishable from the males; and this likewise occurs with many birds. If, however, dull colors were of high importance for the safety of the female during incubation, as with many ground birds, the females which varied in brightness, or which received through inheritance from the males any marked accession of brightness, would sooner or later be destroyed. But the tendency in the males to continue for an indefinite period transmitting to their female offspring their own brightness, would have to be eliminated by a change in the form of inheritance; and this, as shown by our previous illustration, would be extremely difficult. The more probable result of the long-continued destruction of the more brightly-colored females, supposing the equal form of transmission to prevail, would be the lessening or annihilation of the bright colors of the males, owing to their continually crossing with the duller females. It would be tedious to follow out all the other possible results; but I may remind the reader, as shown in the eighth chapter, that if sexually-limited variations in brightness occurred in the females, even if they were not in the least injurious to them and consequently were not eliminated, yet they would not be favored or selected, for the male usually accepts any female, and does not select the more attractive individuals; consequently these variations would be liable to be lost, and would have little influence on the character of the race; and this will aid in accounting for the females being commonly less brightly colored than the males.

In the chapter just referred to, instances were given, and any number might have been added, of variations occurring at different ages, and inherited at the same age. It was also shown that variations which occur late in life are commonly transmitted to the same sex in which they first appeared; while variations occurring early in life are apt to be transmitted to both sexes; not that all the cases of sexually-limited transmission can thus be accounted for. It was further shown that if a male bird varied by becoming brighter while young, such variations would be of no service until the age for reproduction had arrived, and there was competition between rival males. But in the case of birds which live on the ground and which commonly need the protection of dull colors, bright tints would be far more dangerous to the young and inexperienced than to the adult males. Consequently the males which varied in brightness while young would suffer much destruction and be eliminated through natural selection; on the other hand the males which varied in this manner when nearly mature, notwithstanding that they were exposed to some additional danger, might survive, and, from being favored through sexual selection, would procreate their kind. The brightly-colored young males being destroyed and the mature ones being successful in their courtship may account, on the principle of a relation existing between the period of variation and the form of transmission, for the males alone of many birds having acquired and transmitted brilliant colors to their male offspring alone. But I by no means wish to maintain that the influence of age on the form of transmission is indirectly the sole cause of the great difference in brilliancy between the sexes of many birds.

As with all birds in which the sexes differ in color, it is an interesting question whether the males alone have been modified through sexual selection, the females being left, as far as this agency is concerned, unchanged or only partially changed; or whether the females have been specially modified through natural selection for the sake of protection, I will discuss this question at considerable length, even at greater length than its intrinsic importance deserves; for various curious collateral points may thus be conveniently considered.

Before we enter on the subject of color, more especially in reference to Mr. Wallace's conclusions, it may be useful to discuss under a similar point of view some other differences between the sexes. A breed of fowls formerly existed in Germany[5] in which the hens were furnished with spurs; they were good layers, but they so greatly disturbed their nests with their spurs that they could not be allowed to sit on their own eggs. Hence at one time it appeared to me probable that with the females of the wild Gallinaceæ the development of spurs had been checked through natural selection, from the injury thus caused to their nests. This seemed all the more probable as the wing-spurs, which could not be injurious during nidification, are often as well developed in the female as in the male; though in not a few cases they are rather larger in the male. When the male is furnished with leg-spurs the female almost always exhibits rudiments of them—the rudiments sometimes consisting of a mere scale, as with the species of Gallus. Hence it might be argued that the females had aboriginally been furnished with well-developed spurs, but that these had subsequently been lost either through disuse or natural selection. But if this view be admitted, it would have to be extended to innumerable other cases; and it implies that the female progenitors of the existing spur-bearing species were once encumbered with an injurious appendage.

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[5] Bechstein, 'Naturgesch. Deutschlands,' 1793, B. iii. s. 339

In some few genera and species, as in Galloperdix, Acomus, and the Javan peacock (*Pavo muticus*), the females as well as the males possess well-developed spurs. Are we to infer from this fact that they construct a different sort of nest, not liable to be injured by their spurs, from that made by their nearest allies, so that there has been no need for the removal of their spurs? Or are we to suppose that these females especially require spurs for their defence? It is a more probable conclusion that both the presence and absence of spurs in the females result from different laws of inheritance having prevailed, independently of natural selection. With the many females in which spurs appear as rudiments, we may conclude that some few of the successive variations, through which they were developed in the males, occurred very early in life, and were as a consequence transferred to the females. In the other and much rarer cases, in which the females possess fully-developed spurs, we may conclude that all the successive variations were transferred to them; and that they gradually acquired the inherited habit of not disturbing their nests.

The vocal organs and the variously-modified feathers for producing sound, as well as the proper instincts for using them, often differ in the two sexes, but are sometimes the same in both. Can such differences be accounted for by the males having acquired these organs and instincts, while the females have been saved from inheriting them, on account of the danger to which they would have been exposed by attracting the attention of birds or beasts of prey? This does not seem to me probable, when we think of the multitude of birds which with impunity gladden the country with their voices during the spring.[6] It is a safer conclusion that as vocal and instrumental organs are of special service only to the males during their courtship, these organs were developed through sexual selection and continued use in this sex alone—the successive variations and the effects of use having been from the first limited in their transmission in a greater or less degree to the male offspring.

Many analogous cases could be advanced; for instance, the plumes on the head, which are generally longer in the male than in the female, sometimes of equal length in both sexes, and occasionally absent in the female—these several cases sometimes occurring in the same group of birds. It would be difficult to account for a difference of this kind between the sexes on the principle of the female having been benefited by possessing a slightly shorter crest than the male, and its consequent diminution or complete suppression through natural selection. But I will take a more favorable case, namely, the length of the tail. The long train of the peacock would have been not only inconvenient but dangerous to the peahen during the period of incubation and while accompanying her young. Hence there is not the least *a priori* improbability in the development of her tail having been checked through natural selection. But the females of various pheasants, which apparently are exposed on their open nests to as much danger as the peahen, have tails of considerable length. The females as well as the males of the *Menura superba* have long tails, and they build a domed nest which is a great anomaly in so large a bird. Naturalists have wondered how the female Menura could manage her tail during incubation; but it is now known[7] that she "enters the nest head first, and then turns round with her tail sometimes over her back, but more often bent round by her side. Thus in time the tail becomes quite askew, and is a tolerable guide to the length of time the bird has been sitting." Both sexes of an Australian kingfisher (*Tanysiptera sylvia*) have the middle tail-feathers greatly lengthened; and, as the female makes her nest in a hole, these feathers become, as I am informed by Mr. R. B. Sharpe, much crumpled during nidification.

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[6] Daines Barrington, however, thought it probable ('Phil. Transact.' 1773, p. 164) that few female birds sing, because the talent would have been dangerous to them during incubation He adds, that a similar view may possibly account for the inferiority of the female to the male in plumage.

In these two cases the great length of the tail-feathers must be in some degree inconvenient to the female; and, as in both species the tail-feathers of the female are somewhat shorter than those of the male, it might be argued that their full development had been prevented through natural selection. Judging from these cases, if, with the peahen, the development of the tail had been checked only when it became inconveniently or dangerously long, she would have acquired a much longer tail than she actually possesses; for her tail is not nearly so long, relatively to the size of her body, as that of many female pheasants, nor longer than that of the female turkey. It must also be borne in mind that, in accordance with this view, as soon as the tail of the peahen became dangerously long, and its development was consequently checked, she would have continually reacted on her male progeny, and thus have prevented the peacock from acquiring his present magnificent train. We may therefore infer that the length of the tail in the peacock and its shortness in the peahen are the result of the requisite variations in the male having been from the first transmitted to the male offspring alone.

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[7] Mr. Ramsay, in Proc. Zoolog. Soc.' 1868, p. 50.

We are led to a nearly similar conclusion with respect to the length of the tail in the various species of pheasants. In the Eared pheasant (*Crossoptilon auritum*) the tail is of equal length in both sexes, namely, sixteen or seventeen inches; in the common pheasant it is about twenty inches long in the male, and twelve in the female; in Sœmmerring's pheasant, thirty-seven inches in the male, and only eight in the female; and lastly in Reeve's pheasant it is sometimes actually seventy-two inches long in the male and sixteen in the female. Thus in the several species, the tail of the female differs much in length, irrespectively of that of the male; and this can be accounted for, as it seems to me, with much more probability, by the laws of inheritance—that is, by the successive variations having been from the first more or less closely limited in their transmission to the male sex—than by the agency of natural selection, owing to the length of tail having been injurious in a greater or less degree to the females of the several species.

We may now consider Mr. Wallace's arguments in regard to the sexual coloration of birds. He believes that the bright tints, originally acquired through sexual selection by the males, would in all or almost all cases have been transmitted to the females, unless the transference had been checked through natural selection. I may here remind the reader that various facts bearing on this view have already been given under reptiles, amphibians, fishes, and lepidoptera. Mr. Wallace rests his belief chiefly, but not exclusively, as we shall see in the next chapter, on the following statement,[8] that when both sexes are colored in a strikingly-conspicuous manner the nest is of such a nature as to conceal the sitting bird; but when there is a marked contrast of color between the sexes, the male being gay and the female dull colored, the nest is open and exposes the sitting bird to view. This coincidence, as far as it goes, certainly supports the belief that the females which sit on open nests have been specially modified for the sake of protection. Mr. Wallace admits that there are, as might have been expected, some exceptions to his two rules, but it is a question whether the exceptions are not so numerous as seriously to invalidate them.

There is in the first place much truth in the Duke of Argyll's remark,[9] that a large-domed nest is more conspicuous to an enemy, especially to all tree-haunting carnivorous animals, than a smaller open nest. Nor must we forget that with many birds which build open nests the males sit on the eggs and aid in feeding the young as well as the females: this is the case, for instance, with *Pyranga æstiva*,[10] one of the most splendid birds in the United States, the male being vermilion, and the female light brownish-green. Now, if brilliant colors had been extremely dangerous to birds while sitting on their open nests, the males in these cases would have suffered greatly. It might, however, be of such paramount importance to the male to be brilliantly colored, in order to beat his rivals, that this would more than compensate for some additional danger.

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[8] 'Journal of Travel,' edited by A. Murray, vol. i. 1868, p. 78.

[9] Ibid. p. 281.

[10] Audubon, 'Ornithological Biography,' vol. i. p. 233.

Mr. Wallace admits that with the King-crows (Dicrurus), Orioles, and Pittidæ, the females are conspicuously colored, yet they build open nests; but he urges that the birds of the first group are highly pugnacious and could defend themselves; that those of the second group take extreme care in concealing their open nests, but this does not invariably hold good;[11] and that with the birds of the third group the females are brightly colored chiefly on the under surface. Besides these cases the whole great family of pigeons, which are sometimes brightly and almost always conspicuously colored, and which are notoriously liable to the attacks of birds of prey, offers a serious exception to the rule, for pigeons almost always build open and exposed nests. In another large family, that of the Humming-birds, all the species build open nests, yet with some of the most gorgeous species the sexes are alike; and, in the majority, the females, though less brilliant than the males, are very brightly colored. Nor can it be maintained that all female humming-birds, which are brightly colored, escape detection by their tints being green, for some display on their upper surfaces red, blue, and other colors.[12]

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[11] Jerdon, 'Birds of India,' vol. ii. p. 108. Gould's 'Hand-book of the Birds of Australia,' vol. i. p. 463.

[12] For instance, the female *Eupetomena macroura* has the head and tail dark blue with reddish loins; the female *Lampornis porphyrurus* is blackish-green on the upper surface, with the lores and sides of the throat crimson; the female *Eulampis jugularis* has the top of the head and back green, but the loins and the tail are crimson. Many other instances of highly-conspicuous females could be given. See Mr. Gould's magnificent work on this family.

In regard to birds which build in holes or construct domed nests, other advantages, as Mr. Wallace remarks, besides concealment are gained, such as shelter from the rain, greater warmth, and in hot countries protection from the rays of the sun;[13] so that it is no valid objection to his view that many birds having both sexes obscurely colored build concealed nests.[14] The female Horn-bills (*Buceros*), for instance, of India and Africa are protected, during nidification, with extraordinary care, for the male plasters up the hole in which the female sits on her eggs, and leaves only a small orifice through which he feeds her; she is thus kept a close prisoner during the whole period of incubation;[15] yet female hornbills are not more conspicuously colored than many other birds of equal size which build open nests. It is a more serious objection to Mr. Wallace's view, as is admitted by him, that in some few groups the males are brilliantly colored and the females obscure, and yet the latter hatch their eggs in domed nests. This is the case with the Grallinæ of Australia, the Superb Warblers (Maluridæ) of the same country, the Sun-birds (Nectariniæ), and with several of the Australian Honey-suckers or Meliphagidæ.[16]

If we look to the birds of England we shall see that there is no close and general relation between the colors of the female and the nature of the nest constructed by her. About forty of our British birds (excluding those of large size which could defend themselves) build in holes in banks, rocks, or trees, or construct domed nests. If we take the colors of the female goldfinch, bullfinch, or blackbird, as a standard of the degree of conspicuousness, which is not highly dangerous to the sitting female, then, out of the above forty birds, the females of only twelve can be considered as conspicuous to a dangerous degree, the remaining twenty-eight being inconspicuous.[17] Nor is there any close relation between a well-pronounced difference in color between the two sexes and the nature of the nest constructed. Thus the male house-sparrow (*Passer domesticus*) differs much from the female, the male tree-sparrow (*P. montanus*) differs hardly at all, and yet both build well-concealed nests. The two sexes of the common fly-catcher (*Muscicapa grisola*) can hardly be distinguished, while the sexes of the pied fly-catcher (*M. luctuosa*) differ considerably, and both build in holes. The female blackbird (*Turdus merula*) differs much, the female ring-ouzel (*T. torquatus*) differs less, and the female common thrush (*T. musicus*) hardly at all, from their respective males; yet all build open nests. On the other hand, the not very distantly-allied water-ouzel (*Cinclus*

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[13] Mr. Salvin noticed in Guatemala ('Ibis,' 1864, p. 375) that humming-birds were much more unwilling to leave their nests during very hot weather, when the sun was shining brightly, than during cool, cloudy, or rainy weather.

[14] I may specify, as instances of obscurely-colored birds building concealed nests, the species belonging to eight Australian genera, described in Gould's 'Hand-book of the Birds of Australia,' vol. i. pp. 340, 362, 365, 383, 387, 389, 391, 414.

[15] Jerdon, 'Birds of India,' vol. i. p. 244.

[16] On the nidification and colors of these latter species, see Gould's Hand-book,' etc., vol. i. pp. 504, 527.

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[17] I have consulted, on this subject, Macgillivray's 'British Birds,' and though doubts may be entertained in some cases in regard to the degree of concealment of the nest, and of the degree of conspicuousness of the female, yet the following birds, which all lay their eggs in holes or in domed nests, can hardly be considered, according to the above standard, as conspicuous: Passer, 2 species; Sturnus, of which the female is considerably less brilliant than the male; Cinclus; Motacilla boarula (?); Erithacus (?); Fruticola, 2 sp.; Saxicola; Ruticilla, 2 sp.; Sylvia, 3 sp.; Parus, 3 sp.; Mecistura; Anorthura; Certhia; Sitta; Yunx; Muscicapa, 2 sp.; Hirundo, 3 sp.; and Cypselus. The females of the following 12 birds may be considered as conspicuous according to the same standard, viz., Pastor, Motacilla alba, Parus major and P. cæruleus, Upupa, Picus, 4 sp., Coracias, Alcedo, and Merops.

aquaticus) builds a domed nest, and the sexes differ about as much as in the case of the ring-ouzel. The black and red grouse (*Tetrao tetrix* and *T. Scoticus*) build open nests, in equally well-concealed spots, but in the one species the sexes differ greatly, and in the other very little.

Notwithstanding the foregoing objections, I cannot doubt, after reading Mr. Wallace's excellent essay, that, looking to the birds of the world, a large majority of the species in which the females are conspicuously colored (and in this case the males with rare exceptions are equally conspicuous) build concealed nests for the sake of protection. Mr. Wallace enumerates [18] a long series of groups in which this rule holds good; but it will suffice here to give, as instances, the more familiar groups of kingfishers, toucans, trogons, puff-birds (Capitonidæ), plantain-eaters (Musophagæ), woodpeckers, and parrots. Mr. Wallace believes that in these groups, as the males gradually acquired through sexual selection their brilliant colors, these were transferred to the females and were not eliminated by natural selection, owing to the protection which they already enjoyed from their manner of nidification. According to this view, their present manner of nesting was acquired before their present colors. But it seems to me much more probable that, in most cases, as the females were gradually rendered more and more brilliant from partaking of the colors of the male, they were gradually led to change their instincts (supposing that they originally built open nests), and to seek protection by building domed or concealed nests. No one, who studies, for instance, Audubon's account of the differences in the nests of the same species in the Northern and Southern United States,[19] will feel any great difficulty in admitting that birds, either by a change (in the strict sense of the word) of their habits, or through the natural selection of so-called spontaneous variations of instinct, might readily be led to modify their manner of nesting.

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[18] 'Journal of Travel,' edited by A. Murray, vol. i. p. 78.

[19] See many statements in the 'Ornithological Biography.' See, also,

This way of viewing the relation, as far as it holds good, between the bright colors of female birds and their manner of nesting, receives some support from certain analogous cases occurring in the Sahara Desert. Here, as in most other deserts, various birds, and many other animals, have had their colors adapted in a wonderful manner to the tints of the surrounding surface. Nevertheless there are, as I am informed by the Rev. Mr. Tristram, some curious exceptions to the rule; thus the male of the *Monticola cyanea* is conspicuous from his bright-blue color, and the female almost equally conspicuous from her mottled brown and white plumage; both sexes of two species of Dromolæa are of a lustrous black; so that these three birds are far from receiving protection from their colors, yet they are able to survive, for they have acquired the habit, when in danger, of taking refuge in holes or crevices in the rocks.

With respect to the above-specified groups of birds, in which the females are conspicuously colored and build concealed nests, it is not necessary to suppose that each separate species had its nidifying instinct specially modified; but only that the early progenitors of each group were gradually led to build domed or concealed nests; and afterward transmitted this instinct, together with their bright colors, to their modified descendants. This conclusion, as far as it can be trusted, is interesting, namely, that sexual selection, together with equal or nearly equal inheritance by both sexes, has indirectly determined the manner of nidification of whole groups of birds.

some curious observations on the nests of Italian Birds by Engenio Bettoni, in the 'Atti della Società Italiana,' vol. xi. 1869, p. 487.

Even in the groups in which, according to Mr. Wallace, the females, from being protected during nidification, have not had their bright colors eliminated through natural selection, the males often differ in a slight, and occasionally in a considerable degree, from the females. This is a significant fact, for such differences in color must be accounted for on the principle of some of the variations in the males having been from the first limited in their transmission to the same sex; as it can hardly be maintained that these differences, especially when very slight, serve as a protection to the female. Thus all the species in the splendid group of the Trogons build in holes; and Mr. Gould givesfigures[20] of both sexes of twenty-five species, in all of which, with one partial exception, the sexes differ sometimes slightly, sometimes conspicuously in color—the males being always more beautiful than the females, though the latter are likewise beautiful. All the species of kingfisher build in holes, and with most of the species the sexes are equally brilliant, and thus far Mr. Wallace's rule holds good; but in some of the Australian species the colors of the females are rather less vivid than those of the male; and, in one splendidly-colored species, the sexes differ so much that they were at first thought to be specifically distinct.[21] Mr. R. B. Sharpe, who has especially studied this group, has shown me some American species (Ceryle) in which the breast of the male is belted with black. Again, in Carcineutes, the difference between the sexes is conspicuous: in the male the upper surface is dull-blue banded with black, the lower surface being partly fawn-colored, and there is much red about the head; in the female the upper surface is reddish-brown banded with black, and the lower surface white with black markings. It is an interesting fact, as showing how the same peculiar style of sexual coloring often characterizes allied forms, that in three species of Dacelo the male differs from the female only in the tail being dull-blue banded with black, while that of the female is brown with blackish bars; so that here the tail differs in color in the two sexes in exactly the same manner as the whole upper surface in the sexes of Carcineutes.

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[20] See his 'Monograph of the Trogonidæ,' first edition.

[21] Namely Cyanalcyon. Gould's 'Hand-book of the Birds of Australia,' vol. i. p. 133; see, also, pp. 130, 136.

With parrots, which likewise build in holes, we find analogous cases: in most of the species both sexes are brilliantly colored and undistinguishable, but in not a few species the males are colored rather more vividly than the females, or even very differently from them. Thus, besides other strongly-marked differences, the whole under surface of the male King Lory (*Aprosmictus scapulatus*), is scarlet, while the throat and chest of the female are green tinged with red: in the *Euphema splendida* there is a similar difference, the face and wing-coverts, moreover, of the female being of a paler blue than in the male.[22] In the family of the Tits (*Parinæ*), which build concealed nests, the female of our common blue tomtit (*Parus cæruleus*) is "much less brightly colored" than the male; and in the magnificent Sultan yellow tit of India the difference is greater.[23]

Again, in the great group of the woodpeckers,[24] the sexes are generally nearly alike, but in the *Megapicus validus* all those parts of the head, neck, and breast, which are crimson in the male are pale brown in the female. As in several woodpeckers the head of the male is bright crimson, while that of the female is plain, it occurred to me that this color might possibly make the female dangerously conspicuous, whenever she put her head out of the hole containing her nest, and consequently that this color, in accordance with Mr. Wallace's belief, had been eliminated. This view is strengthened by what Malherbe states with respect to *Indopicus carlotta;* namely, that the young females, like the young males, have some crimson about their heads, but that this color disappears in the adult female, while it is intensified in the adult male. Nevertheless, the following considerations render this view extremely doubtful: the male takes a fair share in incubation,[25] and would be thus far almost equally exposed to danger; both sexes of many species have their heads of an equally bright crimson; in other species the difference between the sexes in the amount of scarlet is so slight that it can hardly make any appreciable difference in the danger incurred; and, lastly, the coloring of the head in the two sexes often differs slightly in other ways.

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[22] Every gradation of difference between the sexes may be followed in the parrots of Australia. See Gould's 'Hand-book,' etc., vol. ii. pp. 14–102.

[23] Macgillivray's 'British Birds,' vol. ii. p. 433. Jerdon, 'Birds of India,' vol. ii. p. 282.

[24] All the following facts are taken from M. Malherbe's magnificent 'Monographie des Picidées,' 1861

The cases, as yet given, of slight and graduated differences in color between the males and females in the groups, in which as a general rule the sexes resemble each other, all relate to species which build domed or concealed nests. But similar gradations may likewise be observed in groups in which the sexes as a general rule resemble each other, but which build open nests. As I have before instanced the Australian parrots, so I may here instance, without giving any details, the Australian pigeons.[26] It deserves especial notice that in all these cases the slight differences in plumage between the sexes are of the same general nature as the occasionally greater differences. A good illustration of this fact has already been afforded by those kingfishers in which either the tail alone or the whole upper surface of the plumage differs in the same manner in the two sexes. Similar cases may be observed with parrots and pigeons. The differences in color between the sexes of the same species are, also, of the same general nature as the differences in color between the distinct species of the same group. For, when, in a group in which the sexes are usually alike, the male differs considerably from the female, he is not colored in a quite new style. Hence we may infer that, within the same group, the special colors of both sexes, when they are alike, and the colors of the male, when he differs slightly or even considerably from the female, have in most cases been determined by the same general cause; this being sexual selection.

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[25] Audubon's 'Ornithological Biography,' vol. ii. p. 75; see also the Ibis,' vol. i. p. 268.

[26] Gould's 'Hand-book of the Birds of Australia,' vol. ii. pp. 109–149.

It is not probable, as has already been remarked, that differences in color between the sexes, when very slight, can be of service to the female as a protection. Assuming, however, that they are of service, they might be thought to be cases of transition; but we have no reason to believe that many species at any one time are undergoing change. Therefore, we can hardly admit that the numerous females which differ very slightly in color from their males are now all commencing to become obscure for the sake of protection. Even if we consider somewhat more marked sexual differences, is it probable, for instance, that the head of the female chaffinch, the crimson on the breast of the female bullfinch, the green of the female greenfinch, the crest of the female golden-crested wren, have all been rendered less bright by the slow process of selection for the sake of protection? I cannot think so and still less with the slight differences between the sexes of those birds which build concealed nests. On the other hand, the differences in color between the sexes, whether great or small, may to a large extent be explained on the principle of the successive variations, acquired by the males through sexual selection, having been from the first more or less limited in their transmission to the females. That the degree of limitation should differ in different species of the same group will not surprise any one who has studied the laws of inheritance, for they are so complex that they appear to us in our ignorance to be capricious in their action.[27]

As far as I can discover, there are very few groups of birds, containing a considerable number of species, in which all have both sexes brilliantly colored and alike; but this appears to be the case, as I hear from Mr. Sclater, with the Musophagæ or plantain-eaters. Nor do I believe that any large group exists in which the sexes of all the species are widely dissimilar in color: Mr. Wallace informs me that the chatterers of South America (*Cotingidæ*) offer one of the best instances; but with some of the species, in which the male has a splendid red breast, the female exhibits some red on her breast; and the females of other species show traces of the green and other colors of the males. Nevertheless, we have a near approach to close sexual similarity or dissimilarity throughout several groups: and this, from what has just been said of the fluctuating nature of inheritance, is a somewhat surprising circumstance. But that the same laws should largely prevail with allied animals is not surprising. The domestic fowl has produced a great number of breeds and sub-breeds, and in these the sexes generally differ in plumage; so that it has been noticed as a remarkable circumstance when in certain sub-breeds they resemble each other. On the other hand, the domestic pigeon has likewise produced a vast number of distinct breeds and sub-breeds, and in these, with rare exceptions, the two sexes are identically alike. Therefore, if other species of Gallus and Columba were domesticated and varied, it would not be rash to predict that the same general rules of sexual similarity and dissimilarity, depending on the form of transmission, would, in both cases, hold good. In a similar manner the same form of transmission has generally prevailed throughout the same natural groups, although marked exceptions to this rule occur. Within the same family, or even genus, the sexes may be identically alike or very different in color. Instances have already been given relating to the same genus, as with sparrows, fly-catchers, thrushes, and grouse. In the family of pheasants the males and females of almost all the species are wonderfully dissimilar, but are quite similar in the eared pheasant or *Crossoptilon auritum.* In two species of Chloehaga, a genus of geese, the males cannot be distinguished from the females, except by size; while in two others the sexes are so unlike that they might easily be mistaken for distinct species.[28]

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[27] See remarks to this effect in my work on 'Variation under Domestication,' vol ii. chap. xii.

The laws of inheritance can alone account for the following cases, in which the female, by acquiring at a late period of life certain characters proper to the male, ultimately comes to resemble him in a more or less complete manner. Here protection can hardly have come into play. Mr. Blyth informs me that the females of *Oriolus melanocephalus* and of some allied species, when sufficiently mature to breed, differ considerably in plumage from the adult males; but after the second or third moults they differ only in their beaks having a slight greenish tinge. In the dwarf bitterns (Ardetta), according to the same authority, "the male acquires his final livery at the first moult, the female not before the third or fourth moult; in the mean while she presents an intermediate garb, which is ultimately exchanged for the same livery as that of the male." So, again, the female *Falco peregrinus* acquires her blue plumage more slowly than the male. Mr. Swinhoe states that, with one of the Drongo shrikes (*Dicrurus macrocercus*), the male, while almost a nestling, moults his soft brown plumage and becomes of a uniform glossy greenish-black; but the female retains for a long time the white striæ and spots on the axillary feathers, and does not completely assume the uniform black color of the male for the first three years. The same excellent observer remarks that in the spring of the second year the female spoonbill (Platalea) of China resembles the male of the first year, and that apparently it is not until the third spring that she acquires the same adult plumage as that possessed by the male at a much earlier age. The female *Bombycilla Carolinensis* differs very little from the male, but the appendages, which like beads of red sealing-wax ornament the wing-feathers, are not developed in her so early in life as in the male. The upper mandible in the male of an Indian parrakeet (*Palæornis Javanicus*) is coral-red from his earliest youth, but in the female, as Mr. Blyth has observed with caged and wild birds, it is at first black and does not become red until the bird is at least a year old, at which age the sexes resemble each other in all respects. Both sexes of the wild-turkey are ultimately furnished with a tuft of bristles on the breast, but in two-year-old birds the tuft is about four inches long in the male and hardly apparent in the female; when, however, the latter has reached her fourth year, it is from four to five inches in length.[29]

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[28] The 'Ibis,' vol. vi. 1864, p. 122.

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[29] On Ardetta, Translation of Cuvier's 'Règne Animal,' by Mr. Blyth, foot-note, p. 159. On the Peregrine Falcon, Mr. Blyth, in Charlesworth's 'Mag. of Nat. Hist.' vol. i. 1837, p. 304. On Dicrurus, 'Ibis,' 1863, p. 44. On the Platalea, 'Ibis,' vol. vi. 1864, p. 366. On the Bombycilla,

In these cases, the females follow a normal course of development in ultimately becoming like the males; and such cases must not be confounded with those in which diseased or old females assume masculine characters, or with those in which perfectly fertile females, while young, acquire, through variation or some unknown cause, the characters of the male.[30] But all these cases have so much in common that they depend, according to the hypothesis of pangenesis, on gemmules derived from each part of the male being present, though latent, in the female; their development following on some slight change in the elective affinities of her constituent tissues.

A few words must be added on changes of plumage in relation to the season of the year. From reasons formerly assigned there can be little doubt that the elegant plumes, long pendant feathers, crests, etc., of egrets, herons, and many other birds, which are developed and retained only during the summer, serve exclusively for ornamental or nuptial purposes, though common to both sexes. The female is thus rendered more conspicuous during the period of incubation than during the winter; but such birds as herons and egrets would be able to defend themselves. As, however, plumes would probably be inconvenient and certainly of no use during the winter, it is possible that the habit of moulting twice in the year may have been gradually acquired through natural selection for the sake of casting off inconvenient ornaments during the winter.

Audubon's 'Ornitholog. Biography,' vol. i. p. 229. On the Palæornis, see, also, Jerdon, 'Birds of India,' vol. i. p. 263. On the wild-turkey, Audubon, ibid. vol. i. p. 15: I hear from Judge Caton that in Illinois the female very rarely acquires a tuft.

[30] Mr. Blyth has recorded (Translation of Cuvier's 'Règne Animal,' p. 158) various instances with Lanius, Ruticilla, Linaria, and Anas. Audubon has also recorded a similar case ('Ornith. Biog.' vol. v. p. 519) with *Tyranga æstiva.*

But this view cannot be extended to the many waders, in which the summer and winter plumages differ very little in color. With defenceless species, in which either both sexes or the males alone become extremely conspicuous during the breeding-season—or when the males acquire at this season such long wing or tail feathers as to impede their flight, as with Cosmetornis and Vidua—it certainly at first appears highly probable that the second moult has been gained for the special purpose of throwing off these ornaments. We must, however, remember that many birds, such as Birds of Paradise, the Argus pheasant, and peacock, do not cast their plumes during the winter; and it can hardly be maintained that there is something in the constitution of these birds, at least of the Gallinaceæ, rendering a double moult impossible, for the ptarmigan moults thrice in the year.[31] Hence it must be considered as doubtful whether the many species which moult their ornamental plumes, or lose their bright colors, during the winter, have acquired this habit on account of the inconvenience or danger which they would otherwise have suffered.

I conclude, therefore, that the habit of moulting twice in the year was in most or all cases first acquired for some distinct purpose, perhaps for gaining a warmer winter covering; and that variations in the plumage occurring during the summer were accumulated through sexual selection, and transmitted to the offspring at the same season of the year; such variations being inherited either by both sexes or by the males alone, according to the form of inheritance which prevailed. This appears more probable than that these species in all cases originally tended to retain their ornamental plumage during the winter, but were saved from this through natural selection, owing to the inconvenience or danger thus caused.

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[31] See Gould's 'Birds of Great Britain.'

I have endeavored in this chapter to show that the arguments are not trustworthy in favor of the view that weapons, bright colors, and various ornaments, are now confined to the males owing to the conversion, by means of natural selection, of a tendency to the equal transmission of characters to both sexes into transmission to the male sex alone. It is also doubtful whether the colors of many female birds are due to the preservation, for the sake of protection, of variations which were from the first limited in their transmission to the female sex. But it will be convenient to defer any further discussion on this subject until I treat, in the following chapter, on the differences in plumage between the young and old.

CHAPTER XVI.

Birds—*concluded.*

The Immature Plumage in Relation to the Character of the Plumage in both Sexes when Adult.—Six Classes of Cases.—Sexual Differences between the Males of Closely-allied or Representative Species.—The Female assuming the Characters of the Male.—Plumage of the Young in Relation to the Summer and Winter Plumage of the Adults.—On the Increase of Beauty in the Birds of the World.—Protective Coloring.—Conspicuously-colored Birds.—Novelty appreciated.—Summary of the Four Chapters on Birds.

We must now consider the transmission of characters as limited by age in reference to sexual selection. The truth and importance of the principle of inheritance at corresponding ages need not here be discussed, as enough has already been said on the subject. Before giving the several rather complex rules or classes of cases, under which all the differences in plumage between the young and the old, as far as known to me, may be included, it will be well to make a few preliminary remarks.

With animals of all kinds, when the young differ in color from the adults, and the colors of the former are not, as far as we can see, of any special service, they may generally be attributed, like various embryological structures, to the retention by the young of the character of an early progenitor. But this view can be maintained with confidence only when the young of several species closely resemble each other, and likewise resemble other adult species belonging to the same group; for the latter are the living proofs that such a state of things was formerly possible. Young lions and pumas are marked with feeble stripes or rows of spots, and, as many allied species both young and old are similarly marked, no naturalist, who believes in the gradual evolution of species, will doubt that the progenitor of the lion and puma was a striped animal, the young having retained vestiges of the stripes, like the kittens of black cats, which when grown up are not in the least striped. Many species of deer, which when mature are not spotted, are while young covered with white spots, as are likewise some few species in their adult state. So, again, the young in the whole family of pigs (Suidæ), and in certain rather distantly-allied animals, such as the tapir, are marked with dark longitudinal stripes; but here we have a character apparently derived from an extinct progenitor, and now preserved by the young alone. In all such cases the old have had their colors changed in the course of time, while the young have remained but little altered, and this has been effected through the principle of inheritance at corresponding ages.

This same principle applies to many birds belonging to various groups, in which the young closely resemble each other, and differ much from their respective adult parents. The young of almost all the Gallinaceæ, and of some distantly-allied birds such as ostriches, are, while covered with down, longitudinally striped; but this character points back to a state of things so remote that it hardly concerns us. Young cross-bills (Loxia) have at first straight beaks like those of other finches, and in their immature striated plumage they resemble the mature redpole and female siskin, as well as the young of the goldfinch, greenfinch, and some other allied species. The young of many kinds of buntings (Emberiza) resemble each other, and likewise the adult state of the common bunting, *E. miliaria.* In almost the whole large group of thrushes the young have their breasts spotted—a character which is retained by many species throughout life, but is quite lost by others, as by the *Turdus migratorius.* So, again, with many thrushes, the feathers on the back are mottled before they are moulted for the first time, and this character is retained for life by certain Eastern species. The young of many species of shrikes (Lanius), of some woodpeckers, and of an Indian pigeon (*Chalcophaps Indicus*), are transversely striped on the under surface; and certain allied species or genera when adult are similarly marked. In some closely-allied and resplendent Indian cuckoos (Chrysococcyx), the species when mature differ considerably from each other in color, but the young cannot be distinguished. The young of an Indian goose (*Sarkidiornis melanonotus*) closely resemble in plumage an allied genus, Dendrocygna, when mature.[1] Similar facts will hereafter be given in regard to certain herons. Young black grouse (*Tetrao tetrix*) resemble the young as well as the old of certain other species, for instance, the red grouse or *T. Scoticus.* Finally, as Mr. Blyth, who has attended closely to this subject, has well remarked, the natural affinities of many species are best exhibited in their immature plumage; and, as the true affinities of all organic beings depend on their descent from a common progenitor, this remark strongly confirms the belief that the immature plumage approximately shows us the former or ancestral condition of the species.

Although many young birds belonging to various orders thus give us a glimpse of the plumage of their remote progenitors, yet they are many other birds, both dull-colored and bright-colored, in which the young closely resemble their parents. With such species the young of the different species cannot resemble each other more closely than do the parents; nor can they present striking resemblances to allied forms in their adult state. They give us but little insight into the plumage of their progenitors, excepting in so far that, when the young and the old are colored in the same general manner throughout a whole group of species, it is probable that their progenitors were similarly colored.

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[1] In regard to thrushes, shrikes, and woodpeckers, see Mr. Blyth, in Charlesworth's 'Mag. of Nat. Hist.' vol. i. 1837, p. 304; also foot-note to his translation of Cuvier's 'Règne Animal,' p. 159. I give the case of Loxia from Mr. Blyth's information. On thrushes, see, also, Audubon, 'Ornith. Biography,' vol. ii. p. 195. On Chrysococcyx and Chalcophaps, Blyth, as quoted in Jerdon's 'Birds of India,' vol. iii. p. 485. On Sarkidiornis, Blyth, in 'Ibis,' 1867, p. 175.

We may now consider the classes of cases or rules under which the differences and resemblances, between the plumage of the young and the old, of both sexes or of one sex alone, may be grouped. Rules of this kind were first enounced by Cuvier; but with the progress of knowledge they require some modification and amplification. This I have attempted to do, as far as the extreme complexity of the subject permits, from information derived from various sources; but a full essay on this subject by some competent ornithologist is much needed. In order to ascertain to what extent each rule prevails, I have tabulated the facts given in four great works, namely, Macgillivray on the birds of Britain, Audubon on those of North America, Jerdon on those of India, and Gould on those of Australia. I may here premise, firstly, that the several cases or rules graduate into each other; and, secondly, that, when the young are said to resemble their parents, it is not meant that they are identically alike, for their colors are almost always rather less vivid, and the feathers are softer and often of a different shape.

RULES OR CLASSES OF CASES.

I. When the adult male is more beautiful or conspicuous than the adult female, the young of both sexes in their first plumage closely resemble the adult female, as with the common fowl and peacock; or, as occasionally occurs, they resemble her much more closely than they do the adult male.

II. When the adult female is more conspicuous than the adult male, as sometimes though rarely occurs, the young of both sexes in their first plumage resemble the adult male.

III. When the adult male resembles the adult female, the young of both sexes have a peculiar first plumage of their own, as with the robin.

IV. When the adult male resembles the adult female, the young of both sexes in their first plumage resemble the adults, as with the kingfisher, many parrots, crows, hedge-warblers.

V. When the adults of both sexes have a distinct winter and summer plumage, whether or not the male differs from the female, the young resemble the adults of both sexes in their winter dress, or much more rarely in their summer dress, or they resemble the females alone; or the young may have an intermediate character; or, again, they may differ greatly from the adults in both their seasonal plumages.

VI. In some few cases the young in their first plumage differ from each other according to sex; the young males resembling more or less closely the adult males, and the young females more or less closely the adult females.

Class I.—In this class, the young of both sexes resemble, more or less closely, the adult female, while the adult male differs, often in the most conspicuous manner, from the adult female. Innumerable instances in all Orders could be given; it will suffice to call to mind the common pheasant, duck, and house-sparrow. The cases under this class graduate into others. Thus the two sexes when adult may differ so slightly, and the young so slightly from the adults, that it is doubtful whether such cases ought to come under the present, or under the third or fourth classes. So, again, the young of both sexes, instead of being quite alike, may differ in a slight degree from each other, as in our sixth class. These transitional cases, however, are few in number, or at least are not strongly pronounced, in comparison with those which come strictly under the present class.

The force of the present law is well shown in those groups, in which, as a general rule, the two sexes and the young are all alike; for when the male in these groups does differ from the female, as with certain parrots, kingfishers, pigeons, etc., the young of both sexes resemble the adult female.[2] We see the same fact exhibited still more clearly in certain anomalous cases; thus the male of *Heliothrix auriculata* (one of the humming-birds) differs conspicuously from the female in having a splendid gorget and fine ear-tufts, but the female is remarkable from having a much longer tail than that of the male; now, the young of both sexes resemble (with the exception of the breast being spotted with bronze) the adult female in all respects, including the length of her tail, so that the tail of the male actually becomes shorter as he reaches maturity, which is a most unusual circumstance.[3] Again, the plumage of the male goosander (*Mergus merganser*) is more conspicuously colored, with the scapular and secondary wing-feathers much longer than in the female, but differently from what occurs, as far as I know, in any other bird; the crest of the adult male, though broader than that of the female, is considerably shorter, being only a little above an inch in length; the crest of the female being two and a half inches long. Now, the young of both sexes resemble in all respects the adult female, so that their crests are actually of greater length, though narrower, than in the adult male.[4]

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[2] See, for instance, Mr. Gould's account ('Hand-book of the Birds of Australia,' vol. i. p. 133) of Cyanalcyon (one of the Kingfishers), in which, however, the young male, though resembling the adult female, is less brilliantly colored. In some species of Dacelo the males have blue tails, and the females brown ones; and Mr. R. B. Sharpe informs me that the tail of the young male of *D. Gaudichaudi* is at first brown. Mr. Gould has described (ibid. vol. ii. pp. 14, 20, 37) the sexes and the young of certain Black Cockatoos and of the King Lory, with which the same rule prevails. Also Jerdon ('Birds of India,' vol. i. p. 260) on the *Palæornis rosa*, in which the young are more like the female than the male. See Audubon ('Ornith. Biograph.' vol. ii. p. 475) on the two sexes and the young of *Columba passerina*.

When the young and the females closely resemble each other and both differ from the male, the most obvious conclusion is that the male alone has been modified. Even in the anomalous cases of the Heliothrix and Mergus, it is probable that originally both adult sexes were furnished, the one species with a much elongated tail, and the other with a much elongated crest, these characters having since been partially lost by the adult males from some unexplained cause, and transmitted in their diminished state to their male offspring alone, when arrived at the corresponding age of maturity. The belief that in the present class the male alone has been modified, as far as the differences between the male and the female, together with her young, are concerned, is strongly supported by some remarkable facts recorded by Mr. Blyth,[5] with respect to closely-allied species which represent each other in distinct countries. For with several of these representative species the adult males have undergone a certain amount of change and can be distinguished; the females and the young being undistinguishable, and therefore absolutely unchanged. This is the case with certain Indian chats (Thamnobia), with certain honeysuckers (Nectarinia), shrikes (Tephrodornis), certain kingfishers (Tanysiptera), Kallij pheasants (Gallophasis), and tree-partridges (Arboricola).

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[3] I owe this information to Mr. Gould, who showed me the specimens: see also his 'Introduction to the Trochilidæ,' 1861, p. 120.

[4] Macgillivray, 'Hist. Brit. Birds,' vol. v. pp. 207–214.

[5] See his admirable paper in the 'Journal of the Asiatic Soc. of Bengal,' vol. xix. 1850, p. 223; see also Jerdon, 'Birds of India,' vol. i. in-

In some analogous cases, namely, with birds having a distinct summer and winter plumage, but with the two sexes nearly alike, certain closely-allied species can easily be distinguished in their summer or nuptial plumage, yet are undistinguishable in their winter as well as in their immature plumage. This is the case with some of the closely-allied Indian wag-tails or Motacillæ. Mr. Swinhoe[6] informs me that three species of Ardeola, a genus of herons, which represent each other on separate continents, are "most strikingly different" when ornamented with their summer plumes, but are hardly, if at all, distinguishable during the winter. The young also of these three species in their immature plumage closely resemble the adults in their winter dress. This case is all the more interesting because with two other species of Ardeola both sexes retain, during the winter and summer, nearly the same plumage as that possessed by the first three species during the winter and in their immature state; and this plumage, which is common to several distinct species at different ages and seasons, probably shows us

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troduction, p. xxix. In regard to Tanysiptera, Prof. Schlegel told Mr. Blyth that he could distinguish several distinct races, solely by comparing the adult males.

[6] See also Mr. Swinhoe, in 'Ibis,' July, 1863, p. 131; and a previous paper, with an extract from a note by Mr. Blyth, in 'Ibis,' Jan. 1861 p. 52.

how the progenitor of the genus was colored. In all these cases, the nuptial plumage, which we may assume was originally acquired by the adult males during the breeding-season, and transmitted to the adults of both sexes at the corresponding season, has been modified, while the winter and immature plumages have been left unchanged.

The question naturally arises, How is it that in these latter cases the winter plumage of both sexes, and in the former cases the plumage of the adult females, as well as the immature plumage of the young, have not been at all affected? The species which represent each other in distinct countries will almost always have been exposed to somewhat different conditions, but we can hardly attribute the modification of the plumage in the males alone to this action, seeing that the females and the young, though similarly exposed, have not been affected. Hardly any fact in Nature shows us more clearly how subordinate in importance is the direct action of the conditions of life, in comparison with the accumulation through selection of indefinite variations, than the surprising difference between the sexes of many birds; for both sexes must have consumed the same food and have been exposed to the same climate. Nevertheless we are not precluded from believing that in the course of time new conditions may produce some direct effect; we see only that this is subordinate in importance to the accumulated results of selection. When, however, a species migrates into a new country, and this must precede the formation of representative species, the changed conditions to which they will almost always have been exposed will cause them to undergo, judging from a widely-spread analogy, a certain amount of fluctuating variability. In this case sexual selection, which depends on an element eminently liable to change—namely, the taste or admiration of the female—will have had new shades of color or other differences to act on and accumulate; and, as sexual selection is always at work, it would (judging from what we know of the results on domestic animals of man's unintentional selection) be a surprising fact if animals inhabiting separate districts, which can never cross and thus blend their newly-acquired characters, were not, after a sufficient lapse of time, differently modified. These remarks likewise apply to the nuptial or summer plumage, whether confined to the males or common to both sexes.

Although the females of the above closely-allied species, together with their young, differ hardly at all from each other, so that the males alone can be distinguished, yet in most cases the females of the species within the same genus obviously differ from each other. The differences, however, are rarely as great as between the males. We see this clearly in the whole family of the Gallinaceæ: the females, for instance, of the common and Japan pheasant, and especially of the gold and Amherst pheasant, of the silver pheasant and the wild-fowl, resemble each other very closely in color, while the males differ to an extraordinary degree. So it is with the females of most of the Cotingidæ, Fringillidæ, and many other families. There can indeed be no doubt that, as a general rule, the females have been modified to a less extent than the males. Some few birds, however, offer a singular and inexplicable exception; thus the females of *Paradisea apoda* and *P. Papuana* differ from each other more than do their respective males;[7] the female of the latter species having the under surface pure white, while the female *P. apoda* is deep brown beneath. So, again, as I hear from Prof. Newton, the males of two species of Oxynotus (shrikes), which represent each other in the islands of Mauritius and Bourbon,[8] differ but little in color, while the females differ much. In the Bourbon species the female appears to have partially retained an immature condition of plumage, for at first sight she "might be taken for the young of the Mauritian species." These differences may be compared with those which occur, independently of selection by man, and which we cannot explain, in certain sub-breeds of the game-fowl, in which the females are very different, while the males can hardly be distinguished.[9]

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[7] Wallace, 'The Malay Archipelago,' vol. ii. 1869, p. 394.

[8] These species are described, with colored figures, by M. F. Pollen, in 'Ibis,' 1866, p. 275.

As I account so largely by sexual selection for the differences between the males of allied species, how can the differences between the females be accounted for in all ordinary cases? We need not here consider the species which belong to distinct genera; for, with these, adaptation to different habits of life, and other agencies, will have come into play. In regard to the differences between the females within the same genus, it appears to me almost certain, after looking through various large groups, that the chief agent has been the transference, in a greater or less degree, to the female of the characters acquired by the males through sexual selection. In the several British finches, the two sexes differ either very slightly or considerably; and if we compare the females of the greenfinch, chaffinch, goldfinch, bullfinch, crossbill, sparrow, etc., we shall see that they differ from each other chiefly in the points in which they partially resemble their respective males; and the colors of the males may safely be attributed to sexual selection. With many gallinaceous species the sexes differ to an extreme degree, as with the peacock, pheasant, and fowl, while with other species there has been a partial or even complete transference of character from the male to the female. The females of the several species of Polyplectron exhibit in a dim condition, and chiefly on the tail, the splendid ocelli of their males. The female partridge differs from the male only in the red mark on her breast being smaller; and the female wild-turkey only in her colors being much duller. In the guinea-fowl the two sexes are undistinguishable. There is no improbability in the plain, though peculiar spotted plumage of this latter bird having been acquired through sexual selection by the males, and then transmitted to both sexes; for it is not essentially different from the much more beautifully-spotted plumage, characteristic of the males alone of the Tragopan pheasants.

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[9] 'Variation of Animals, etc., under Domestication,' vol. i. p. 251.

It should be observed that, in some instances, the transference of characters from the male to the female has been effected apparently at a remote period, the male having subsequently undergone great changes, without transferring to the female any of his later-gained characters. For instance, the female and the young of the black-grouse (*Tetrao tetrix*) resemble pretty closely both sexes and the young of the red-grouse (*T. Scoticus*); and we may consequently infer that the black-grouse is descended from some ancient species, of which both sexes were colored in nearly the same manner as the red-grouse. As both sexes of this latter species are more plainly barred during the breeding-season than at any other time, and as the male differs slightly from the female in his more strongly-pronounced red and brown tints,[10] we may conclude that his plumage has been, at least to a certain extent, influenced by sexual selection. If so, we may further infer that the nearly similar plumage of the female black-grouse was similarly produced at some former period. But since this period the male black-grouse has acquired his fine black plumage, with his forked and outwardly-curled tail-feathers; but of these characters there has hardly been any transference to the female, excepting that she shows in her tail a trace of the curved fork.

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[10] Macgillivray, 'Hist. British Birds,' vol. i. pp. 172–174.

We may therefore conclude that the females of distinct though allied species have often had their plumage rendered more or less different by the transference, in various degrees, of characters acquired, both during former and recent times, by the males through sexual selection. But it deserves especial attention that brilliant colors have been transferred much more rarely than other tints. For instance, the male of the red-throated bluebreast (*Cyanecula suecica*) has a rich blue breast, including a sub-triangular red mark; now, marks of approximately the same shape have been transferred to the female, but the central space is fulvous instead of red, and is surrounded by mottled instead of blue feathers. The Gallinaceæ offer many analogous cases; for none of the species, such as partridges, quails, guinea-fowls, etc., in which the colors of the plumage have been largely transferred from the male to the female, are brilliantly colored. This is well exemplified with the pheasants, in which the male is generally so much more brilliant than the female; but with the Eared and Cheer pheasants (*Crossoptilon auritum* and *Phasianus Wallichii*) the two sexes closely resemble each other, and their colors are dull. We may go so far as to believe that, if any part of the plumage in the males of these two pheasants had been brilliantly colored, this would not have been transferred to the females. These facts strongly support Mr. Wallace's view, that, with birds which are exposed to much danger during nidification, the transference of bright colors from the male to the female has been checked through natural selection. We must not, however, forget that another explanation, before given, is possible; namely, that the males which varied and became bright, while they were young and inexperienced, would have been exposed to much danger, and would generally have been destroyed; the older and more cautious males, on the other hand, if they varied in a like manner, would not only have been able to survive, but would have been favored in their rivalry with other males. Now, variations occurring late in life tend to be transmitted exclusively to the same sex, so that in this case extremely bright tints would not have been transmitted to the females. On the other hand, ornaments of a less conspicuous kind, such as those possessed by the Eared and Cheer pheasants, would not have been dangerous, and, if they appeared during early youth, would generally have been transmitted to both sexes.

In addition to the effects of the partial transference of characters from the males to the females, some of the differences between the females of closely-allied species may be attributed to the direct or definite action of the conditions of life.[11] With the males any such action would generally have been masked by the brilliant colors gained through sexual selection; but, not so with the females. Each of the endless diversities in plumage, which we see in our domesticated birds, is, of course, the result of some definite cause; and, under natural and more uniform conditions, some one tint, assuming that it was in no way injurious, would almost certainly sooner or later prevail The free intercrossing of many individuals belonging to the same species would ultimately tend to make any change of color, thus induced, uniform in character.

No one doubts that both sexes of many birds have had their colors adapted for the sake of protection; and it is possible that the females alone of some species may have been thus modified. Although it would be a difficult, perhaps an impossible process, as shown in the last chapter, to convert through selection one form of transmission into another, there would not be the least difficulty in adapting the colors of the female, independently of those of the male, to surrounding objects, through the accumulation of variations which were from the first limited in their transmission to the female sex. If the variations were not thus limited, the bright tints of the male would be deteriorated or destroyed. Whether the females alone of many species have been thus specially modified, is at present very doubtful. I wish I could follow Mr. Wallace to the full extent; for the admission would remove some difficulties. Any variations which were of no service to the female as a protection would be at once obliterated, instead of being lost simply by not being selected, or from free intercrossing, or from being eliminated when transferred to the male and in any way injurious to him. Thus the plumage of the female would be kept constant in character. It would also be a relief if we could admit that the obscure tints of both sexes of many birds had been acquired and preserved for the sake of protection—for example, of the hedge-warbler or kitty-wren (*Accentor modularis* and *Troglodytes vulgaris*), with respect to which we have no sufficient evidence of the action of sexual selection. We ought, however, to be cautious in concluding that colors, which appear to us dull, are not attractive to the females of certain species; we should bear in mind such cases as that of the common house-sparrow, in which the male differs much from the female, but does not exhibit any bright tints. No one probably will dispute that many gallinaceous birds which live on the open ground have acquired their present colors, at least in part, for the sake of protection. We know how well they are thus concealed; we know that ptarmigans, while changing from their winter to their summer plumage, both of which are protective, suffer greatly from birds of prey. But can we believe that the very slight differences in tints and markings between, for instance, the female black and red grouse serve as a protection? Are partridges, as they are now colored, better protected than if they had resembled quails? Do the slight differences between the females of the common pheasant, the Japan and golden pheasants, serve as a protection, or might not their plumages have been interchanged with impunity? From what Mr. Wallace has observed of the habits of certain gallinaceous birds in the East, he thinks that such slight differences are beneficial. For myself, I will only say that I am not convinced.

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[11] See, on this subject, chap. xxiii. in the 'Variation of Animals and Plants under Domestication.'

Formerly, when I was inclined to lay much stress on the principle of protection, as accounting for the less bright colors of female birds, it occurred to me that possibly both sexes and the young might aboriginally have been brightly colored in an equal degree; but that, subsequently, the females, from the danger incurred during incubation, and the young, from being inexperienced, had been rendered dull as a protection. But this view is not supported by any evidence, and is not probable; for we thus in imagination expose during past times the females and the young to danger, from which it has subsequently been necessary to shield their modified descendants. We have, also, to reduce, through a gradual process of selection, the females and the young to almost exactly the same tints and markings, and to transmit them to the corresponding sex and period of life. It is also a somewhat strange fact, on the supposition that the females and the young have partaken, during each stage of the process of modification, of a tendency to be as brightly colored as the males, that the females have never been rendered dull-colored without the young participating in the same change; for there are no instances, as far as I can discover, of species with the females dull-colored and the young bright-colored. A partial exception, however, is offered by the young of certain woodpeckers, for they have "the whole upper part of the head tinged with red," which afterward either decreases into a mere circular red line in the adults of both sexes, or quite disappears in the adult females.[12]

Finally, with respect to our present class of cases, the most probable view appears to be, that successive variations in brightness or in other ornamental characters, occurring in the males at a rather late period of life have, alone been preserved; and that most or all of these variations, owing to the late period of life at which they appeared, have been from the first transmitted only to the adult male offspring. Any variations in brightness which occurred in the females or in the young would have been of no service to them, and would not have been selected; moreover, if dangerous, would have been eliminated. Thus the females and the young will either have been left unmodified, or, and this has much more commonly occurred, will have been partially modified, by receiving, through transference from the males, some of the successive variations. Both sexes have perhaps been directly acted on by the conditions of life to which they have long been exposed; but the females, from not being otherwise much modified, will best exhibit any such effects. These changes and all others will have been kept uniform by the free intercrossing of many individuals. In some cases, especially with ground-birds, the females and the young may possibly have been modified, independently of the males, for the sake of protection, so as to have acquired the same dull-colored plumage.

Class II. *When the adult female is more conspicuous than the adult male, the young of both sexes in their first plumage resemble the adult male.*—This class is exactly the reverse of the last, for the females are here more brightly colored or more conspicuous than the males; and the young, as far as they are known, resemble the adult males instead of the adult females. But the difference between the sexes is never nearly so great as occurs with many birds in the first class, and the cases are comparatively rare. Mr. Wallace, who first called attention to the singular relation which exists between the less bright colors of the males and their performing the duties of incubation, lays great stress on this point,[13] as a crucial test that obscure colors have been acquired for the sake of protection during the period of nesting. A different view seems to me more probable. As the cases are curious, and not numerous, I will briefly give all that I have been able to find.

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[12] Audubon, 'Ornith. Biography,' vol. i. p. 193. Macgillivray, 'Hist. Brit. Birds,' vol. iii. p. 85. See also the case before given of *Indopicus carlotta.*

In one section of the genus Turnix, quail-like birds, the female is invariably larger than the male (being nearly twice as large in one of the Australian species), and this is an unusual circumstance with the Gallinaceæ. In most of the species the female is more distinctly colored and brighter than the male,[14] but in some few species the sexes are alike. In *Turnix taigoor* of India the male "wants the black on the throat and neck, and the whole tone of the plumage is lighter and less pronounced than that of the female." The female appears to be more vociferous, and is certainly much more pugnacious, than the male; so that the females and not the males are often kept by the natives for fighting, like game-cocks. As male birds are exposed by the English bird-catchers for a decoy near a trap, in order to catch other males by exciting their rivalry, so the females of this Turnix are employed in India When thus exposed the females soon begin their "loud purring call, which can be heard a long way off, and any females within ear-shot run rapidly to the spot, and commence fighting with the caged bird." In this way from twelve to twenty birds, all breeding-females, may be caught in the course of a single day. The natives assert that the females after laying their eggs associate in flocks, and leave the males to sit on them. There is no reason to doubt the truth of this assertion, which is supported by some observations made in China by Mr. Swinhoe.[15] Mr. Blyth believes that the young of both sexes resemble the adult male.

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[13] 'Westminster Review, July, 1867, and A. Murray, 'Journal of Travel,' 1868, p. 83.

[14] For the Australian species, see Gould's 'Hand-book,' etc., vol. ii pp. 178, 180, 186, 188. In the British Museum specimens of the Australian Plain-wanderer (*Pedionomus torquatus*) may be seen, showing similar sexual differences.

The females of the three species of Painted Snipes (Rhynchæa) "are not only larger, but much more richly colored than the males."[16] With all other birds, in which the trachea differs in structure in the two sexes, it is more developed and complex in the male than in the female; but in the *Rhynchæa Australis* it is simple in the male, while in the female it makes four distinct convolutions before entering the lungs.[17] The female, therefore, of this species has acquired an eminently masculine character. Mr. Blyth ascertained, by examining many specimens, that the trachea is not convoluted in either sex of *R. Bengalensis*, which species so closely resembles *R. Australis* that it can hardly be distinguished except by its shorter toes. This fact is another striking instance of the law that secondary sexual characters are often widely different in closely-allied forms; though it is a very rare circumstance when such differences relate to the female sex. The young of both sexes of *R. Bengalensis* in their first plumage are said to resemble the mature male.[18] There is also reason to believe that the male undertakes the duty of incubation, for Mr. Swinhoe[19] found the females before the close of the summer associated in flocks, as occurs with the females of the Turnix.

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[15] Jerdon, 'Birds of India,' vol. iii. p. 596. Mr. Swinhoe, in 'Ibis,' 1865, p. 542, 1866, pp 131, 405.

[16] Jerdon, 'Birds of India.' vol. iii. p. 677.

[17] Gould's 'Hand-book of the Birds of Australia,' vol. ii. p. 275.

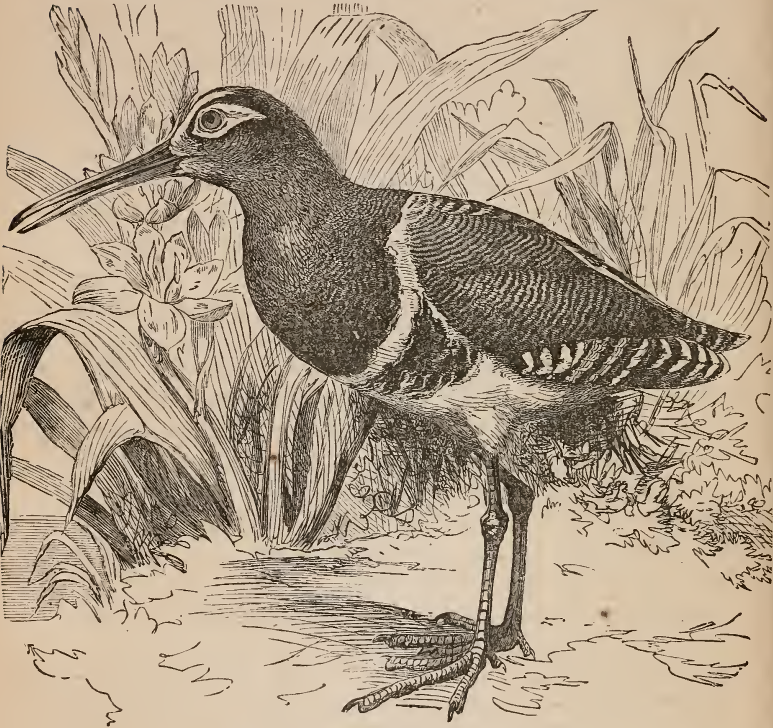

FIG. 60.—Rhynchæa capensis (from Brehm).

The females of *Phalaropus fulicarius* and *P. hyperboreus* are larger, and in their summer plumage "more gayly attired than the males." But the difference in color between the sexes is far from conspicuous. The male alone of *P. fulicarius* undertakes, according to Prof. Steenstrup, the duty of incubation, as is likewise shown by the state of his breast-feathers during the breeding-season. The female of the dotterel plover (*Eudromias morinellus*) is larger than the male, and has the red and black tints on the lower surface, the white crescent on the breast, and the stripes over the eyes, more strongly pronounced. The male also takes at least a share in hatching the eggs; but the female likewise attends to the young.[20] I have not been able to discover whether with these species the young resemble the adult males more closely than the adult females; for the comparison is somewhat difficult to make on account of the double moult.

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[18] 'The Indian Field,' Sept. 1858, p. 3.

[19] 'Ibis,' 1866, p. 298.

Turning now to the Ostrich order: the male of the common cassowary (*Casuarius galeatus*) would be thought by any one to be the female, from his smaller size and from the appendages and naked skin about his head being much less brightly colored; and I am informed by Mr. Bartlett that in the Zoological Gardens it is certainly the male alone who sits on the eggs and takes care of the young.[21] The female is said by Mr. T. W. Wood[22] to exhibit during the breeding-season a most pugnacious disposition; and her wattles then become enlarged and more brilliantly colored. So, again, the female of one of the emus (*Dromœus irroratus*) is considerably larger than the male, and she possesses a slight top-knot, but is otherwise undistinguishable in plumage. She appears, however, "to have greater power, when angry or otherwise excited, of erecting, like a turkey-cock, the feathers of her neck and breast. She is usually the more courageous and pugilistic. She makes a deep, hollow, guttural boom, especially at night, sounding like a small gong. The male has a slenderer frame and is more docile, with no voice beyond a suppressed hiss when angry, or a croak." He not only performs the whole duty of incubation, but has to defend the young from their mother; "for as soon as she catches sight of her progeny she becomes violently agitated, and notwithstanding the resistance of the father appears to use her utmost endeavors to destroy them. For months afterward it is unsafe to put the parents together, violent quarrels being the inevitable result, in which the female generally comes off conqueror."[23] So that with this emu we have a complete reversal not only of the parental and incubating instincts, but of the usual moral qualities of the two sexes; the females being savage, quarrelsome, and noisy, the males gentle and good. The case is very different with the African ostrich, for the male is somewhat larger than the female and has finer plumes with more strongly-contrasted colors; nevertheless, he undertakes the whole duty of incubation.[24]

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[20] For these several statements, see Mr. Gould's 'Birds of Great Britain.' Prof. Newton informs me that he has long been convinced, from his own observations and from those of others, that the males of the above-named species take either the whole or a large share of the duties of incubation, and that they "show much greater devotion toward their young, when in danger, than do the females." So it is, as he informs me, with *Limosa lapponica* and some few other Waders, in which the females are larger and have more strongly-contrasted colors than the males.

[21] The natives of Ceram (Wallace, 'Malay Archipelago,' vol. ii. p. 150) assert that the male and female sit alternately on the eggs; but this assertion, as Mr. Bartlett thinks, may be accounted for by the female visiting the nest to lay her eggs.

[22] 'The Student,' April, 1870, p. 124.

I will specify the few other cases known to me, in which the female is more conspicuously colored than the male, although nothing is known about their manner of incubation. With the carrion-hawk of the Falkland Islands (*Milvago leucurus*) I was much surprised to find by dissection that the individuals, which had all their tints strongly pronounced, with the cere and legs orange-colored, were the adult females; while those with duller plumage and gray legs were the males or the young. In an Australian tree-creeper (*Climacteris erythrops*) the female differs from the male in "being adorned with beautiful, radiated, rufous markings on the throat, the male having this part quite plain." Lastly, in an Australian night-jar "the female always exceeds the male in size and in the brilliance of her tints; the males, on the other hand, have two white spots on the primaries more conspicuous than in the female."[25]

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[23] See the excellent account of the habits of this bird under confinement, by Mr. A. W. Bennett, in 'Land and Water,' May, 1868, p. 233.

[24] Mr. Sclater, on the incubation of the Struthiones, 'Proc. Zool. Soc.,' June 9, 1863.

We thus see that the cases in which female birds are more conspicuously colored than the males, with the young in their immature plumage resembling the adult males instead of the adult females, as in the previous class, are not numerous, though they are distributed in various Orders. The amount of difference, also, between the sexes is incomparably less than that which frequently occurs in the last class; so that the cause of the difference, whatever it may have been, has acted on the females in the present class either less energetically or less persistently than on the males in the last class. Mr. Wallace believes that the males have had their colors rendered less conspicuous for the sake of protection during the period of incubation; but the difference between the sexes in hardly any of the foregoing cases appears sufficiently great for this view to be safely accepted. In some of the cases the brighter tints of the female are almost confined to the lower surface, and the males, if thus colored, would not have been exposed to danger while sitting on the eggs. It should also be borne in mind that the males are not only in a slight degree less conspicuously colored than the females, but are of less size, and have less strength. They have, moreover, not only acquired the maternal instinct of incubation, but are less pugnacious and vociferous than the females, and in one instance have simpler vocal organs. Thus an almost complete transposition of the instincts, habits, disposition, color, size, and of some points of structure, has been effected between the two sexes.

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[25] For the Milvago, see 'Zoology of the Voyage of the Beagle,' Birds, 1841, p. 16. For the Climacteris and night-jar (Eurostopodus), see Gould's 'Hand-book of the Birds of Australia,' vol. i. pp. 602, 97. The New Zealand shieldrake (*Tadorna variegata*) offers a quite anomalous case: the head of the female is pure white, and her back is redder than that of the male; the head of the male is of a rich dark bronzed color, and his back is clothed with finely-pencilled slate-colored feathers, so that he may altogether be considered as the more beautiful of the two. He is larger and more pugnacious than the female, and does not sit on the eggs. So that in all these respects this species comes under our first class of cases; but Mr. Sclater ('Proc. Zool. Soc.' 1866, p. 150) was much surprised to observe that the young of both sexes, when about three months old, resembled in their dark heads and necks the adult males, instead of the adult females; so that it would appear in this case that the females have been modified, while the males and the young have retained a former state of plumage.

Now if we might assume that the males in the present class have lost some of that ardor which is usual to their sex, so that they no longer search eagerly for the females; or, if we might assume that the females have become much more numerous than the males—and in the case of one Indian Turnix the females are said to be "much more commonly met with than the males"[26]—then it is not improbable that the females would have been led to court the males, instead of being courted by them. This, indeed, is the case to a certain extent, with some birds, as we have seen with the peahen, wild-turkey, and certain kinds of grouse. Taking as our guide the habits of most male birds, the greater size and strength and the extraordinary pugnacity of the females of the Turnix and Emu, must mean that they endeavor to drive away rival females, in order to gain possession of the male; and on this view, all the facts become clear; for the males would probably be most charmed or excited by the females which were the most attractive to them by their brighter colors, other ornaments, or vocal powers. Sexual selection would then soon do its work, steadily adding to the attractions of the females; the males and the young being left not at all, or but little modified.

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[26] Jerdon, 'Birds of India,' vol. iii. p. 598.

Class III.—*When the adult male resembles the adult female, the young of both sexes have a peculiar first plumage of their own.*—In this class both sexes when adult resemble each other, and differ from the young. This occurs with many birds of many kinds. The male robin can hardly be distinguished from the female, but the young are widely different with their mottled dusky-olive and brown plumage. The male and female of the splendid scarlet Ibis are alike, while the young are brown; and the scarlet color, though common to both sexes, is apparently a sexual character, for it is not well developed with birds under confinement, in the same manner as often occurs in the case of brilliantly-colored male birds. With many species of herons the young differ greatly from the adults, and their summer plumage, though common to both sexes, clearly has a nuptial character. Young swans are slate-colored, while the mature birds are pure white; but it would be superfluous to give additional instances. These differences between the young and the old apparently depend, as in the last two classes, on the young having retained a former or ancient state of plumage, which has been exchanged for a new plumage by the old of both sexes. When the adults are brightly colored, we may conclude from the remarks just made in relation to the scarlet ibis and to many herons, and from the analogy of the species in the first class, that such colors have been acquired through sexual selection by the nearly mature males; but that, differently from what occurs in the first two classes, the transmission, though limited to the same age, has not been limited to the same sex. Consequently both sexes, when mature, resemble each other and differ from the young.

CLASS IV. *When the adult male resembles the adult female, the young of both sexes in their first plumage resemble the adults.*—In this class the young and the adults of both sexes, whether brilliantly or obscurely colored, resemble each other. Such cases are, I think, more common than those in the last class. We have in England instances in the kingfisher, some woodpeckers, the jay, magpie, crow, and many small dull-colored birds, such as the hedge-warbler or kitty-wren. But the similarity in plumage between the young and the old is never absolutely complete, and graduates away into dissimilarity. Thus the young of some members of the kingfisher family are not only less vividly colored than the adults, but many of the feathers on the lower surface are edged with brown [27]—a vestige probably of a former state of the plumage. Frequently in the same group of birds, even within the same genus, for instance in an Australian genus of parrokeets (Platycercus), the young of some species closely resemble, while the young of other species differ considerably from their parents of both sexes, which are alike.[28] Both sexes and the young of the common jay are closely similar; but in the Canada jay (*Perisoreus Canadensis*) the young differ so much from their parents that they were formerly described as distinct species.[29]

[27] Jerdon, 'Birds of India,' vol. i. pp. 222, 228. Gould's 'Hand-book of the Birds of Australia,' vol. i. pp. 124, 130.

[28] Gould, Ibid. vol. ii. pp. 37, 46, 56.

[29] Audubon, 'Ornith. Biography,' vol. ii. p. 55.

Before proceeding, I may remark that under the present and two next classes of cases the facts are so complex, and the conclusions so doubtful, that any one who feels no especial interest in the subject had better pass them over.

The brilliant or conspicuous colors which characterize many birds in the present class, can rarely or never be of service to them as a protection; so that they have probably been gained by the males through sexual selection, and then transferred to the females and the young. It is, however, possible that the males may have selected the more attractive females; and if these transmitted their characters to their offspring of both sexes, the same results would follow as from the selection of the more attractive males by the females. But there is some evidence that this contingency has rarely, if ever, occurred in any of those groups of birds in which the sexes are generally alike; for if even a few of the successive variations had failed to be transmitted to both sexes, the females would have exceeded to a slight degree the males in beauty. Exactly the reverse occurs under nature; for in almost every large group, in which the sexes generally resemble each other, the males of some few species are in a slight degree more brightly colored than the females. It is again possible that the females may have selected the more beautiful males, these males having reciprocally selected the more beautiful females; but it is doubtful whether this double process of selection would be likely to occur, owing to the greater eagerness of one sex than the other, and whether it would be more efficient than selection on one side alone. It is, therefore, the most probable view that sexual selection has acted, in the present class, as far as ornamental characters are concerned, in accordance with the general rule throughout the animal kingdom, that is, on the males; and that these have transmitted their gradually-acquired colors, either equally or almost equally, to their offspring of both sexes.

Another point is more doubtful, namely, whether the successive variations first appeared in the males after they had become nearly mature, or while quite young. In either case sexual selection must have acted on the male when he had to compete with rivals for the possession of the female; and in both cases the characters thus acquired have been transmitted to both sexes and all ages. But these characters, if acquired by the males when adult, may have been transmitted at first to the adults alone, and at some subsequent period transferred to the young. For it is known that when the law of inheritance at corresponding ages fails, the offspring often inherit characters at an earlier age than that at which they first appeared in their parents.[30] Cases apparently of this kind have been observed with birds in a state of nature. For instance, Mr. Blyth has seen specimens of *Lanius rufus* and of *Colymbus glacialis* which had assumed while young, in a quite anomalous manner, the adult plumage of their parents.[31] Again, the young of the common swan (*Cygnus olor*) do not cast off their dark feathers and become white until eighteen months or two years old; but Dr. F. Forel has described the case of three vigorous young birds, out of a brood of four, which were born pure white. These young birds were not albinoes, as shown by the color of their beaks and legs, which nearly resembled the same parts in the adults.[32]

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[30] 'Variation of Animals and Plants under Domestication,' vol. ii. p. 79.

[31] Charlesworth, 'Mag. of Nat. Hist.' vol. i. 1837, pp. 305, 306.

[32] 'Bulletin de la Soc. Vaudoise des Sc. Nat.' vol. x. 1869, p. 132. The young of the Polish swan, *Cygnus immutabilis* of Yarrell, are always white; but this species, as Mr. Sclater informs me, is believed to be nothing more than a variety of the Domestic Swan (*Cygnus olor*).

It may be worth while to illustrate the above three modes by which, in the present class, the two sexes and the young may have come to resemble each other, by the curious case of the genus Passer.[33] In the house-sparrow (*P. domesticus*) the male differs much from the female and from the young. These resemble each other, and likewise to a large extent both sexes and the young of the sparrow of Palestine (*P. brachydactylus*), as well as of some allied species. We may therefore assume that the female and young of the house-sparrow approximately show us the plumage of the progenitor of the genus. Now with the tree-sparrow (*P. montanus*) both sexes and the young closely resemble the male of the house-sparrow; so that they have all been modified in the same manner, and all depart from the typical coloring of their early progenitor. This may have been effected by a male ancestor of the tree-sparrow having varied, firstly, when nearly mature, or, secondly, while quite young, having in either case transmitted his modified plumage to the females and the young; or, thirdly, he may have varied when adult and transmitted his plumage to both adult sexes, and, owing to the failure of the law of inheritance at corresponding ages, at some subsequent period to his young.

It is impossible to decide which of these three modes has generally prevailed throughout the present class of cases. The belief that the males varied while young, and transmitted their variations to their offspring of both sexes, is perhaps the most probable. I may here add that I have endeavored, with little success, by consulting various works, to decide how far with birds the period of variation has generally determined the transmission of characters to one sex or to both. The two rules, often referred to (namely, that variations occurring late in life are transmitted to one and the same sex, while those which occur early in life are transmitted to both sexes), apparently hold good in the first,[34] second, and fourth classes of cases; but they fail in an equal number, namely, in the third, often in the fifth,[35] and in the sixth small class. They hold good, however, as far as I can judge, with a considerable majority of the species of birds. Whether or not this be so, we may conclude from the facts given in the eighth chapter that the period of variation has been one important element in determining the form of transmission.

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[33] I am indebted to Mr. Blyth for information in regard to this genus. The sparrow of Palestine belongs to the sub-genus Petronia.

With birds it is difficult to decide by what standard we ought to judge of the earliness or lateness of the period of variation, whether by the age in reference to the duration of life, or to the power of reproduction, or to the number of moults through which the species passes. The moulting of birds, even within the same family, sometimes differs much without any assignable cause. Some birds moult so early, that nearly all the body-feathers are cast off before the first wing-feathers are fully grown; and we cannot believe that this was the primordial state of things. When the period of moulting has been accelerated, the age at which the colors of the adult plumage were first developed would falsely appear to us to have been earlier than it really was. This may be illustrated by the practice followed by some bird-fanciers, who pull out a few feathers from the breasts of nestling bullfinches, and from the head or neck of young gold-pheasants, in order to ascertain their sex; for in the males these feathers are immediately replaced by colored ones.[36] The actual duration of life is known in but few birds, so that we can hardly judge by this standard. And with reference to the period at which the powers of reproduction are gained, it is a remarkable fact that various birds occasionally breed while retaining their immature plumage.[37]

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[34] For instance, the males of *Tanagra æstiva* and *Fringilla cyanea* require three years, the male of *Fringilla ciris* four years, to complete their beautiful plumage. (See Audubon, 'Ornith. Biography,' vol. i. pp. 233, 280, 378.) The Harlequin duck takes three years (ibid. vol. iii. p. 614). The male of the Gold pheasant, as I hear from Mr. J. Jenner Weir, can be distinguished from the female when about three months old, but he does not acquire his full splendor until the end of the September in the following year.

[35] Thus the *Ibis tantalus* and *Grus Americanus* take four years, the Flamingo several years, and the *Ardea Ludovicana* two years, before they acquire their perfect plumage See Audubon, ibid. vol. i. p. 221; vol. iii. pp. 133, 139, 211.

The fact of birds breeding in their immature plumage seems opposed to the belief that sexual selection has played as important a part as I believe it has in giving ornamental colors, plumes, etc., to the males, and, by means of equal transmission, to the females of many species. The objection would be a valid one, if the younger and less ornamented males were as successful in winning females and propagating their kind, as the older and more beautiful males. But we have no reason to suppose that this is the case. Audubon speaks of the breeding of the immature males of *Ibis tantalus* as a rare event, as does Mr. Swinhoe, in regard to the immature males of Oriolus.[38] If the young of any species in their immature plumage were more successful in winning partners than the adults, the adult plumage would probably soon be lost, as the males which retained their immature dress for the longest period would prevail, and thus the character of the species would ultimately be modified.[39] If, on the other hand, the young never succeeded in obtaining a female, the habit of early reproduction would perhaps be sooner or later quite eliminated, from being superfluous and entailing waste of power.

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[36] Mr. Blyth, in Charlesworth's 'Mag. of Nat. Hist.' vol. i. 1837, p. 300. Mr. Bartlett has informed me in regard to gold-pheasants.

[37] I have noticed the following cases in Audubon's 'Ornith. Biography. The Redstart of America' (*Muscicapa ruticilla*, vol. i. p. 203). The *Ibis tantalus* takes four years to come to full maturity, but sometimes breeds in the second year (vol. iii. p. 133). The *Grus Americanus* takes the same time, but breeds before acquiring its full plumage (vol. iii. p. 211). The adults of *Ardea cærulea* are blue and the young white; and white, mottled, and mature blue birds may all be seen breeding together (vol. iv. p. 58): but Mr. Blyth informs me that certain herons apparently are dimorphic, for white and colored individuals of the same age may be observed. The Harlequin duck (*Anas histrionica*, Linn.) takes three years to acquire its full plumage, though many birds breed in the second year (vol. iii. p. 614). The Whiteheaded Eagle (*Falco leucocephalus*, vol. iii. p. 210) is likewise known to breed in its immature state. Some species of Oriolus (according to Mr. Blyth and Mr. Swinhoe, in 'Ibis,' July 1863, p. 68) likewise breed before they attain their full plumage.

The plumage of certain birds goes on increasing in beauty during many years after they are fully mature; this is the case with the train of the peacock, and with the crest and plumes of certain herons; for instance, the *Ardea Ludovicana*;[40] but it is very doubtful whether the continued development of such feathers is the result of the selection of successive beneficial variations, or merely of continuous growth. Most fishes continue increasing in size, as long as they are in good health and have plenty of food; and a somewhat similar law may prevail with the plumes of birds.

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[38] See the last foot-note.

[39] Other animals, belonging to quite distinct classes, are either habitually or occasionally capable of breeding before they have fully acquired their adult characters. This is the case with the young males of the salmon. Several amphibians have been known to breed while retaining their larval structure. Fritz Müller has shown ('Facts and Arguments for Darwin,' Eng. Trans. 1869, p. 79) that the males of several amphipod crustaceans become sexually mature while young; and I infer that this is a case of premature breeding, because they have not as yet acquired their fully-developed claspers. All such facts are highly interesting, as bearing on one means by which species may undergo great modifications of character, in accordance with Mr. Cope's views, expressed under the terms of the "retardation and acceleration of generic characters;" but I cannot follow the views of this eminent naturalist to their full extent. See Mr. Cope, "On the Origin of Genera," from the 'Proc. of Acad. Nat. Sc. of Philadelphia,' Oct. 1868.

[40] Jerdon, 'Birds of India,' vol. iii. p. 507, on the peacock. Audubon, ibid. vol. iii. p. 139, on the Ardea.

CLASS V. *When the adults of both sexes have a distinct winter and summer plumage, whether or not the male differs from the female, the young resemble the adults of both sexes in their winter dress, or much more rarely in their summer dress, or they resemble the females alone; or the young may have an intermediate character; or, again, they may differ greatly from the adults in both their seasonal plumages.*—The cases in this class are singularly complex; nor is this surprising, as they depend on inheritance, limited in a greater or less degree in three different ways, namely, by sex, age, and the season of the year. In some cases the individuals of the same species pass through at least five distinct states of plumage. With the species, in which the male differs from the female during the summer season alone, or, which is rarer, during both seasons,[41] the young generally resemble the females—as with the so-called goldfinch of North America, and apparently with the splendid Maluri of Australia.[42] With the species, the sexes of which are alike during both the summer and winter, the young may resemble the adults, firstly, in their winter dress; secondly, which occurs much more rarely, in their summer dress; thirdly, they may be intermediate between these two states; and, fourthly, they may differ greatly from the adults at all seasons. We have an instance of the first of these four cases in one of the egrets of India (*Buphus coromandus*), in which the young and the adults of both sexes are white during the winter, the adults becoming golden-buff during the summer. With the Gaper (*Anastomus oscitans*) of India we have a similar case, but the colors are reversed; for the young and the adults of both sexes are gray and black during the winter, the adults becoming white during the summer.[43] As an instance of the second case, the young of the razor-bill (*Alca torda*, Linn.), in an early state of plumage, are colored like the adults during the summer; and the young of the white-crowned sparrow of North America (*Fringilla leucophrys*), as soon as fledged, have elegant white stripes on their heads, which are lost by the young and the old during the winter.[44] With respect to the third case, namely, that of the young having an intermediate character between the summer and winter adult plumages, Yarrell[45] insists that this occurs with many waders. Lastly, in regard to the young differing greatly from both sexes in their adult summer and winter plumages, this occurs with some herons and egrets of North America and India—the young alone being white.

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[41] For illustrative cases see vol. iv. of Macgillivray's 'Hist. Brit. Birds;' on Tringa, etc., pp. 229, 271; on the Machetes, p. 172; on the *Charadrius hiaticula*, p. 118; on the *Charadrius pluvialis*, p. 94.

[42] For the goldfinch of North America, *Fringilla tristis*, Linn., see Audubon, 'Ornith. Biography,' vol. i. p. 172. For the Maluri, Gould's Handbook of the Birds of Australia,' vol. i. p. 318.

I will make only a few remarks on these complicated cases. When the young resemble the female in her summer dress, or the adults of both sexes in their winter dress, the cases differ from those given under Classes I. and III. only in the characters originally acquired by the males during the breeding-season having been limited in their transmission to the corresponding season. When the adults have a distinct summer and winter plumage, and the young differ from both, the case is more difficult to understand. We may admit as probable that the young have retained an ancient state of plumage; we can account through sexual selection for the summer or nuptial plumage of the adults, but how are we to account for their distinct winter plumage? If we could admit that this plumage serves in all cases as a protection, its acquirement would be a simple affair; but there seems no good reason for this admission. It may be suggested that the widely-different conditions of life during the winter and summer have acted in a direct manner on the plumage; this may have had some effect, but I have not much confidence in so great a difference, as we sometimes see, between the two plumages having been thus caused. A more probable explanation is, that an ancient style of plumage, partially modified through the transference of some characters from the summer plumage, has been retained by the adults during the winter. Finally, all the cases in our present class apparently depend on characters acquired by the adult males, having been variously limited in their transmission according to age, season, and sex; but it would not be worth while to attempt to follow out these complex relations.

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[43] I am indebted to Mr. Blyth for information in regard to the Buphus: see also Jerdon, 'Birds of India,' vol. iii. p. 749. On the Anastomus, see Blyth, in 'Ibis,' 1867, p. 173.

[44] On the Alca, see Macgillivray, 'Hist. Brit. Birds,' vol. v. p. 347 On the *Fringilla leucophrys*, Audubon, ibid. vol. ii. p. 89. I shall have hereafter to refer to the young of certain herons and egrets being white.

[45] 'History of British Birds,' vol. i. 1839, p. 159.

CLASS VI. *The young in their first plumage differ from each other according to sex; the young males resembling more or less closely the adult males, and the young females more or less closely the adult females.*— The cases in the present class, though occurring in various groups, are not numerous; yet, if experience had not taught us to the contrary, it seems the most natural thing that the young should at first always resemble to a certain extent, and gradually become more and more like, the adults of the same sex. The adult male blackcap (*Sylvia atricapilla*) has a black head, that of the female being reddish-brown; and I am informed by Mr. Blyth that the young of both sexes can be distinguished by this character even as nestlings. In the family of thrushes an unusual number of similar cases have been noticed; the male blackbird (*Turdus merula*) can be distinguished in the nest from the female, as the main wing-feathers, which are not moulted so soon as the body-feathers, retain a brownish tint until the second general moult.[46] The two sexes of the mocking-bird (*Turdus polyglottus*, Linn.) differ very little from each other, yet the males can easily be distinguished at a very early age from the females by showing more pure white.[47] The males of a forest-thrush and of a rock-thrush (viz., *Orocetes erythrogastra* and *Petrocincla cyanea*) have much of their plumage of a fine blue, while the females are brown; and the nestling males of both species have their main wing and tail feathers edged with blue, while those of the female are edged with brown.[48] So that the very same feathers which in the young blackbird assume their mature character and become black after the others, in these two species assume this character and become blue before the others. The most probable view with reference to these cases is that the males, differently from what occurs in Class I., have transmitted their colors to their male offspring at an earlier age than that at which they themselves first acquired them; for if they had varied while quite young, they would probably have transmitted all their characters to their offspring of both sexes.[49]

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[46] Blyth, in Charlesworth's 'Mag. of Nat. Hist.' vol. i. 1837, p. 362; and from information given to me by him.

[47] Audubon, 'Ornith. Biography,' vol. i. p. 113.

[48] Mr. C. A. Wright, in 'Ibis,' vol. vi. 1864, p. 65. Jerdon, 'Birds of India,' vol. i. p. 515.

[49] The following additional cases may be mentioned: the young males

In *Aïthurus polytmus* (one of the humming-birds) the male is splendidly colored black and green, and two of the tail-feathers are immensely lengthened; the female has an ordinary tail and inconspicuous colors; now the young males, instead of resembling the adult female, in accordance with the common rule, begin from the first to assume the colors proper to their sex, and their tail-feathers soon become elongated. I owe this information to Mr. Gould, who has given me the following more striking and as yet unpublished case: Two humming-birds belonging to the genus Eustephanus, both beautifully colored, inhabit the small island of Juan Fernandez, and have always been ranked as specifically distinct. But it has lately been ascertained that the one, which is of a rich chesnut-brown color with a golden-red head, is the male, while the other, which is elegantly variegated with green and white, with a metallic-green head, is the female. Now the young from the first resemble to a certain extent the adults of the corresponding sex, the resemblance gradually becoming more and more complete.

In considering this last case, if as before we take the plumage of the young as our guide, it would appear that both sexes have been independently rendered beautiful; and not that the one sex has partially transferred its beauty to the other. The male apparently has acquired his bright colors through sexual selection in the same manner as, for instance, the peacock or pheasant in our first class of cases; and the female in the same manner as the female Rhynchæa or Turnix in our second class of cases. But there is much difficulty in understanding how this

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of *Tanagra rubra* can be distinguished from the young females (Audubon, 'Ornith. Biography,' vol. iv. p. 392), and so it is with the nestlings of a blue nuthatch, *Dendrophila frontalis* of India (Jerdon, 'Birds of India, vol. i. p. 389). Mr. Blyth also informs me that the sexes of the stone chat, *Saxicola rubicola*, are distinguishable at a very early age.

could have been effected at the same time with the two sexes of the same species. Mr. Salvin states, as we have seen in the eighth chapter, that with certain humming-birds the males greatly exceed in number the females, while with other species inhabiting the same country the females greatly exceed the males. If, then, we might assume that during some former lengthened period the males of the Juan Fernandez species had greatly exceeded the females in number, but that during another lengthened period the females had greatly exceeded the males, we could understand how the males at one time, and the females at another time, might have been rendered beautiful by the selection of the brighter-colored individuals of either sex; both sexes transmitting their characters to their young at a rather earlier age than usual. Whether this is the true explanation I will not pretend to say; but the case is too remarkable to be passed over without notice.

We have now seen in numerous instances, under all six classes, that an intimate relation exists between the plumage of the young and that of the adults, either of one sex or both sexes. These relations are fairly well explained on the principle that one sex—this being in the great majority of cases the male—first acquired through variation and sexual selection bright colors or other ornaments, and transmitted them in various ways, in accordance with the recognized laws of inheritance. Why variations have occurred at different periods of life, even sometimes with the species of the same group, we do not know; but with respect to the form of transmission, one important determining cause seems to have been the age at which the variations first appeared.

From the principle of inheritance at corresponding ages, and from any variations in color which occurred in the males at an early age not being then selected, on the contrary being often eliminated as dangerous, while similar variations occurring at or near the period of reproduction have been preserved, it follows that the plumage of the young will often have been left unmodified, or but little modified. We thus get some insight into the coloring of the progenitors of our existing species. In a vast number of species, in five out of our six classes of cases, the adults of one sex or both are brightly colored, at least during the breeding-season, while the young are invariably less brightly colored than the adults, or are quite dull-colored; for no instance is known, as far as I can discover, of the young of dull-colored species displaying bright colors, or of the young of brightly-colored species being more brilliantly colored than their parents. In the fourth class, however, in which the young and the old resemble each other, there are many species (though by no means all) brightly-colored, and as these form whole groups we may infer that their early progenitors were likewise brightly-colored. With this exception, if we look to the birds of the world, it appears that their beauty has been greatly increased since that period, of which we have a partial record in their immature plumage.

On the Color of the Plumage in relation to Protection.—It will have been seen that I cannot follow Mr. Wallace in the belief that dull colors when confined to the females have been in most cases specially gained for the sake of protection. There can, however, be no doubt, as formerly remarked, that both sexes of many birds have had their colors modified for this purpose, so as to escape the notice of their enemies; or, in some instances, so as to approach their prey unobserved, in the same manner as owls have had their plumage rendered soft, that their flight may not be overheard. Mr. Wallace remarks[50] that "it is only in the tropics, among forests that never lose their foliage, that we find whole groups of birds whose chief color is green." It will be admitted by every one, who has ever tried, how difficult it is to distinguish parrots in a leaf-covered tree. Nevertheless, we must remember that many parrots are ornamented with crimson, blue, and orange tints, which can hardly be protective. Woodpeckers are eminently arboreal, but, besides green species, there are many black and black-and-white kinds—all the species being apparently exposed to nearly the same dangers. It is therefore probable that strongly-pronounced colors have been acquired by tree-haunting birds through sexual selection, but that green tints have had an advantage through natural selection over other colors for the sake of protection.

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[50] Westminster Review,' July, 1867, p. 5.

In regard to birds which live on the ground, every one admits that they are colored so as to imitate the surrounding surface. How difficult it is to see a partridge, snipe, woodcock, certain plovers, larks, and night-jars, when crouched on the ground! Animals inhabiting deserts offer the most striking instances, for the bare surface affords no concealment, and all the smaller quadrupeds, reptiles, and birds, depend for safety on their colors. As Mr. Tristram has remarked,[51] in regard to the inhabitants of the Sahara, all are protected by their "isabelline or sand-color." Calling to my recollection the desert-birds which I had seen in South America, as well as most of the ground-birds in Great Britain, it appeared to me that both sexes in such cases are generally colored nearly alike. Accordingly, I applied to Mr. Tristram, with respect to the birds of the Sahara, and he has kindly given me the following information: There are twenty-six species, belonging to fifteen genera, which manifestly have had their plumage colored in a protective manner; and this coloring is all the more striking, as with most of these birds it is different from that of their congeners. Both sexes of thirteen out of the twenty-six species are colored in the same manner; but these belong to genera in which this rule commonly prevails, so that they tell us nothing about the protective colors being the same in both sexes of desert-birds. Of the other thirteen species, three belong to genera in which the sexes usually differ from each other, yet they have the sexes alike. In the remaining ten species, the male differs from the female; but the difference is confined chiefly to the under surface of the plumage, which is concealed when the bird crouches on the ground, the head and back being of the same sand-colored hue in both sexes. So that in these ten species the upper surfaces of both sexes have been acted on and rendered alike, through natural selection, for the sake of protection; while the lower surfaces of the males alone have been diversified through sexual selection, for the sake of ornament. Here, as both sexes are equally well protected, we clearly see that the females have not been prevented through natural selection from inheriting the colors of their male parents: we must look to the law of sexually-limited transmission, as before explained.

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[51] 'Ibis,' 1859, vol. i. p. 429, *et seq.*

In all parts of the world both sexes of many soft-billed birds, especially those which frequent reeds or sedges, are obscurely colored. No doubt, if their colors had been brilliant, they would have been much more conspicuous to their enemies; but whether their dull tints have been specially gained for the sake of protection seems, as far as I can judge, rather doubtful. It is still more doubtful whether such dull tints can have been gained for the sake of ornament. We must, however, bear in mind that male birds, though dull-colored, often differ much from their females, as with the common sparrow, and this leads to the belief that such colors have been gained through sexual selection, from being attractive. Many of the soft-billed birds are songsters; and a discussion in a former chapter should not be forgotten, in which it was shown that the best songsters are rarely ornamented with bright tints. It would appear that female birds, as a general rule, have selected their mates either for their sweet voices or gay colors, but not for both charms combined. Some species which are manifestly colored for the sake of protection, such as the jack-snipe, woodcock, and night-jar, are likewise marked and shaded, according to our standard of taste, with extreme elegance. In such cases we may conclude that both natural and sexual selection have acted conjointly for protection and ornament. Whether any bird exists which does not possess some special attraction, by which to charm the opposite sex, may be doubted. When both sexes are so obscurely colored, that it would be rash to assume the agency of sexual selection, and when no direct evidence can be advanced showing that such colors serve as a protection, it is best to own complete ignorance of the cause, or, which comes to nearly the same thing, to attribute the result to the direct action of the conditions of life.

There are many birds both sexes of which are conspicuously though not brilliantly colored, such as the numerous black, white, or piebald species; and these colors are probably the result of sexual selection. With the common blackbird, capercailzie, black-cock, black Scoter-duck (Oidemia), and even with one of the Birds of Paradise (*Lophorina atra*), the males alone are black, while the females are brown or mottled; and there can hardly be a doubt that blackness in these cases has been a sexually-selected character. Therefore it is in some degree probable that the complete or partial blackness of both sexes in such birds as crows, certain cockatoos, storks, and swans, and many marine birds, is likewise the result of sexual selection, accompanied by equal transmission to both sexes; for blackness can hardly serve in any case as a protection. With several birds, in which the male alone is black, and in others in which both sexes are black, the beak or skin about the head is brightly colored, and the contrast thus afforded adds greatly to their beauty; we see this in the bright-yellow beak of the male blackbird, in the crimson skin over the eyes of the black-cock and capercailzie, in the variously and brightly colored beak of the Scoter-drake (Oidemia), in the red beak of the chough (*Corvus graculus*, Linn.), of the black swan, and black stork. This leads me to remark that it is not at all incredible that toucans may owe the enormous size of their beaks to sexual selection, for the sake of displaying the diversified and vivid stripes of color with which these organs are ornamented.[52] The naked skin at the base of the beak and round the eyes is likewise often brilliantly colored; and Mr. Gould, in speaking of one species,[53] says that the colors of the beak "are doubtless in the finest and most brilliant state during the the time of pairing." There is no greater improbability in toucans being encumbered with immense beaks, though rendered as light as possible by their cancellated structure, for an object falsely appearing to us unimportant, namely, the display of fine colors, than that the male Argus pheasant and some other birds should be encumbered with plumes so long as to impede their flight.

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[52] No satisfactory explanation has ever been offered of the immense size, and still less of the bright colors, of the toucan's beak. Mr. Bates ('The Naturalist on the Amazons,' vol. ii. 1863, p. 341) states that they use their beak for reaching fruit at the extreme tips of the branches; and likewise, as stated by other authors, for extracting eggs and young birds from the nests of other birds. But, as Mr. Bates admits, the beak "can scarcely be considered a very perfectly-formed instrument for the end to which it is applied." The great bulk of the beak, as shown by its breadth, depth, as well as length, is not intelligible on the view that t serves merely as an organ of prehension.

[53] Ramphastos carinatus, Gould's 'Monograph of Ramphastidæ.'

In the same manner, as the males alone of various species are black, the females being dull-colored; so in a few cases the males alone are either wholly or partially white, as with the several Bell-birds of South America (Chasmorhynchus), the Antarctic goose (*Bernicla antarctica*), the silver-pheasant, etc., while the females are brown or obscurely mottled. Therefore, on the same principle as before, it is probable that both sexes of many birds, such as white cockatoos, several egrets with their beautiful plumes, certain ibises, gulls, terns, etc., have acquired their more or less completely white plumage through sexual selection. The species which inhabit snowy regions of course come under a different head. The white plumage of some of the above-named birds appears in both sexes only when they are mature. This is likewise the case with certain gannets, tropic-birds, etc., and with the snow-goose (*Anser hyperboreus*). As the latter breeds on the "barren grounds," when not covered with snow, and as it migrates southward during the winter, there is no reason to suppose that its snow-white adult plumage serves as a protection. In the case of the *Anastomus oscitans* previously alluded to, we have still better evidence that the white plumage is a nuptial character, for it is developed only during the summer; the young in their immature state, and the adults in their winter dress, being gray and black. With many kinds of gulls (Larus), the head and neck become pure white during the summer, being gray or mottled during the winter and in the young state. On the other hand, with the smaller gulls, or sea-mews (Gavia), and with some terns (Sterna), exactly the reverse occurs; for the heads of the young birds during the first year, and of the adults during the winter, are either pure white, or much paler-colored than during the breeding-season. These latter cases offer another instance of the capricious manner in which sexual selection appears often to have acted.[54]

The cause of aquatic birds having acquired a white plumage so much more frequently than terrestrial birds, probably depends on their large size and strong powers of flight, so that they can easily defend themselves or escape from birds of prey, to which, moreover, they are not much exposed. Consequently sexual selection has not here been interfered with or guided for the sake of protection. No doubt, with birds which roam over the open ocean, the males and females could find each other much more easily when made conspicuous either by being perfectly white, or intensely black; so that these colors may possible serve the same end as the call-notes of many land-birds. A white or black bird, when it discovers and flies down to a carcass floating on the sea or cast up on the beach, will be seen from a great distance, and will guide other birds of the same and of distinct species, to the prey; but as this would be a disadvantage to the first finders, the individuals which were the whitest or blackest would not thus have procured more food than the less strongly colored individuals. Hence conspicuous colors cannot have been gradually acquired for this purpose through natural selection.[55]

As sexual selection depends on so fluctuating an element as taste, we can understand how it is that within the same group of birds, with habits of life nearly the same, there should exist white or nearly white, as well as black, or nearly black species—for instance, white and black cockatoos, storks, ibises, swans, terns, and petrels. Piebald birds likewise sometimes occur in the same groups, for instance, the black-necked swan, certain terns, and the common magpie. That a strong contrast in color is agreeable to birds, we may conclude, by looking through any large collection of specimens or series of colored plates, for the sexes frequently differ from each other in the male having the pale parts of a purer white, and the variously-colored dark parts of still darker tints than in the female.

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[54] On Larus, Gavia, and Sterna, see Macgillivray, 'Hist. Brit. Birds,' vol. v. pp. 515, 584, 626. On the Anser hyperboreus, Audubon, 'Ornith. Biography,' vol. iv. p. 562. On the Anastomus, Mr. Blyth, in 'Ibis,' 1867, p. 173.

[55] It may be noticed that with vultures, which roam far and wide through the higher regions of the atmosphere, like marine birds over the ocean, three or four species are almost wholly or largely white, and many other species are black. This fact supports the conjecture that these conspicuous colors may aid the sexes in finding each other during the breeding-season.

It would even appear that mere novelty, or change for the sake of change, has sometimes acted like a charm on female birds, in the same manner as changes of fashion with us. The Duke of Argyll says[56]—and I am glad to have the unusual satisfaction of following for even a short distance in his footsteps—"I am more and more convinced that variety, mere variety, must be admitted to be an object and an aim in Nature." I wish the Duke had explained what he here means by Nature. Is it meant that the Creator of the universe ordained diversified results for His own satisfaction, or for that of man? The former notion seems to me as much wanting in due reverence as the latter in probability. Capriciousness of taste in the birds themselves appears a more fitting explanation. For example: the males of some parrots can hardly be said to be more beautiful, at least according to our taste, than the females, but they differ from them in such points as the male having a rose-colored collar instead of, as in the female, "a bright emeraldine narrow green collar;" or in the male having a black collar instead of "a yellow demi-collar in front," with a pale roseate instead of a plum-blue head.[57] As so many male birds have for their chief ornament elongated tail-feathers or elongated crests, the shortened tail, formerly described in the male of a humming-bird, and the shortened crest of the male goosander almost seem like one of the many opposite changes of fashion which we admire in our own dresses.

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[56] 'The Journal of Travel, edited by A. Murray, vol. i. 1868, p. 286.

Some members of the heron family offer a still more curious case of novelty in coloring having apparently been appreciated for the sake of novelty. The young of the *Ardea asha* are white, the adults being dark slate-colored; and not only the young, but the adults of the allied *Buphus coromandus* in their winter plumage are white, this color changing into a rich golden-buff during the breeding-season. It is incredible that the young of these two species, as well as of some other members of the same family,[58] should have been specially rendered pure white and thus made conspicuous to their enemies; or that the adults of one of these two species should have been specially rendered white during the winter in a country which is never covered with snow. On the other hand, we have reason to believe that whiteness has been gained by many birds as a sexual ornament. We may therefore conclude that an early progenitor of the *Ardea asha* and the *Buphus* acquired a white plumage for nuptial purposes, and transmitted this color to their young; so that the young and the old became white like certain existing egrets; the whiteness having afterward been retained by the young while exchanged by the adults for more strongly-pronounced tints. But if we could look still further backward in time to the still earlier progenitors of these two species, we should probably see the adults dark-colored. I infer that this would be the case, from the analogy of many other birds, which are dark while young, and when adult are white; and more especially from the case of the *Ardea gularis*, the colors of which are the reverse of those of *A. asha*, for the young are dark-colored and the adults white, the young having retained a former state of plumage. It appears, therefore, that the progenitors in their adult condition of the *Ardea asha*, the *Buphus*, and of some allies, have undergone, during a long line of descent, the following changes of color: firstly a dark shade, secondly pure white, and thirdly, owing to another change of fashion (if I may so express myself), their present slaty, reddish, or golden-buff tints. These successive changes are intelligible only on the principle of novelty having been admired by birds for the sake of novelty.

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[57] See Jerdon on the genus Palæornis, 'Birds of India,' vol. i. pp. 258–260.

[58] The young of *Ardea rufescens* and *A. cœrulea* of the United States are likewise white, the adults being colored in accordance with their specific names. Audubon ('Ornith. Biography,' vol. iii. p. 416; vol. iv. p. 58) seems rather pleased at the thought that this remarkable change of plumage will greatly "disconcert the systematists."

Summary of the Four Chapters on Birds.—Most male birds are highly pugnacious during the breeding-season, and some possess weapons especially adapted for fighting with their rivals. But the most pugnacious and the best-armed males rarely or never depend for success solely on their power to drive away or kill their rivals, but have special means for charming the female. With some it is the power of song, or of emitting strange cries, or of producing instrumental music, and the males in consequence differ from the females in their vocal organs, or in the structure of certain feathers. From the curiously-diversified means for producing various sounds we gain a high idea of the importance of this means of courtship. Many birds endeavor to charm the females by love-dances or antics, performed on the ground or in the air, and sometimes at prepared places. But ornaments of many kinds the most brilliant tints, combs and wattles, beautiful plumes, elongated feathers, top-knots, and so forth, are by far the commonest means. In some cases mere novelty appears to have acted as a charm. The ornaments of the males must be highly important to them, for they have been acquired in not a few cases at the cost of increased danger from enemies, and even at some loss of power in fighting with their rivals. The males of very many species do not assume their ornamental dress until they arrive at maturity, or they assume it only during the breeding-season, or the tints then become more vivid. Certain ornamental appendages become enlarged, turgid, and bright-colored, during the very act of courtship. The males display their charms with elaborate care and to the best effect; and this is done in the presence of the females. The courtship is sometimes a prolonged affair, and many males and females congregate at an appointed place. To suppose that the females do not appreciate the beauty of the males is to admit that their splendid decorations, all their pomp and display, are useless; and this is incredible. Birds have fine powers of discrimination, and in some few instances it can be shown that they have a taste for the beautiful. The females, moreover, are known occasionally to exhibit a marked preference or antipathy for certain individual males.

If it be admitted that the females prefer, or are unconsciously excited by, the more beautiful males, then the males would slowly but surely be rendered more and more attractive through sexual selection. That it is this sex which has been chiefly modified we may infer from the fact that in almost every genus in which the sexes differ, the males differ much more from each other than do the females; this is well shown in certain closely-allied representative species in which the females can hardly be distinguished, while the males are quite distinct. Birds in a state of nature offer individual differences which would amply suffice for the work of sexual selection; but we have seen that they occasionally present more strongly-marked variations, which recur so frequently that they would immediately be fixed, if they served to allure the female. The laws of variation will have determined the nature of the initial changes, and largely influenced the final result. The gradations, which may be observed between the males of allied species, indicate the nature of the steps which have been passed through, and explain in the most interesting manner certain characters, such as the indented ocelli of the tail-feathers of the peacock, and the wonderfully-shaded ocelli of the wing-feathers of the Argus pheasant. It is evident that the brilliant colors, top-knots, fine plumes, etc., of many male birds cannot have been acquired as a protection; indeed, they sometimes lead to danger. That they are not due to the direct and definite action of the conditions of life, we may feel assured, because the females have been exposed to the same conditions, and yet often differ from the males to an extreme degree. Although it is probable that changed conditions acting during a lengthened period have produced some definite effect on both sexes, the more important result will have been an increased tendency to fluctuating variability or to augmented individual differences; and such differences will have afforded an excellent groundwork for the action of sexual selection.

The laws of inheritance, irrespectively of selection, appear to have determined whether the characters acquired by the males for the sake of ornament, for producing various sounds, and for fighting together, have been transmitted to the males alone or to both sexes, either permanently or periodically during certain seasons of the year. Why various characters should sometimes have been transmitted in one way and sometimes in another is, in most cases, not known; but the period of variability seems often to have been the determining cause. When the two sexes have inherited all characters in common they necessarily resemble each other; but, as the successive variations may be differently transmitted, every possible gradation may be found, even within the same genus, from the closest similarity to the widest dissimilarity between the sexes. With many closely-allied species, following nearly the same habits of life, the males have come to differ from each other chiefly through the action of sexual selection; while the females have come to differ chiefly from partaking in a greater or lesser degree of the characters thus acquired by the males. The effects, moreover, of the definite action of the conditions of life, will not have been masked in the females, as in the case of the males, by the accumulation through sexual selection of strongly-pronounced colors and other ornaments. The individuals of both sexes, however affected, will have been kept at each successive period nearly uniform by the free intercrossing of many individuals.

With the species, in which the sexes differ in color, it is possible that at first there existed a tendency to transmit the successive variations equally to both sexes; and that the females were prevented from acquiring the bright colors of the males, on account of the danger to which they would have been exposed during incubation. But it would be, as far as I can see, an extremely difficult process to convert, by means of natural selection, one form of transmission into another. On the other hand, there would not be the least difficulty in rendering a female dull-colored, the male being still kept bright-colored, by the selection of successive variations, which were from the first limited in their transmission to the same sex. Whether the females of many species have actually been thus modified, must at present remain doubtful. When, through the law of the equal transmission of characters to both sexes, the females have been rendered as conspicuously colored as the males, their instincts have often been modified, and they have been led to build domed or concealed nests.

In one small and curious class of cases the characters and habits of the two sexes have been completely transposed, for the females are larger, stronger, more vociferous, and brightly-colored than the males. They have, also, become so quarrelsome that they often fight together like the males of the most pugnacious species. If, as seems probable, they habitually drive away rival females, and by the display of their bright colors or other charms endeavor to attract the males, we can understand how it is that they have gradually been rendered, by means of sexual selection and sexually-limited transmission, more beautiful than the males—the latter being left unmodified or only slightly modified.

Whenever the law of inheritance at corresponding ages prevails, but not that of sexually-limited transmission, then if the parents vary late in life—and we know that this constantly occurs with our poultry, and occasionally with other birds—the young will be left unaffected, while the adults of both sexes will be modified. If both these laws of inheritance prevail and either sex varies late in life, that sex alone will be modified, the other sex and the young being left unaffected. When variations in brightness or in other conspicuous characters occur early in life, as no doubt often happens, they will not be acted on through sexual selection until the period of reproduction arrives; consequently, if dangerous to the young, they will be eliminated through natural selection. Thus we can understand how it is that variations arising late in life have so often been preserved for the ornamentation of the males, the females and the young being left almost unaffected, and therefore like each other. With species having a distinct summer and winter plumage, the males of which either resemble or differ from the females during both seasons or during the summer alone, the degrees and kinds of resemblance between the young and the old are exceedingly complex; and this complexity apparently depends on characters, first acquired by the males, being transmitted in various ways and degrees, as limited by age, sex, and season.

As the young of so many species have been but little modified in color and in other ornaments, we are enabled to form some judgment with respect to the plumage of their early progenitors; and we may infer that the beauty of our existing species, if we look to the whole class, has been largely increased since that period of which the immature plumage gives us an indirect record. Many birds, especially those which live much on the ground, have undoubtedly been obscurely colored for the sake of protection. In some instances the upper exposed surface of the plumage has been thus colored in both sexes, while the lower surface in the males alone has been variously ornamented through sexual selection. Finally, from the facts given in these four chapters, we may conclude that weapons for battle, organs for producing sound, ornaments of many kinds, bright and conspicuous colors, have generally been acquired by the males through variation and sexual selection, and have been transmitted in various ways according to the several laws of inheritance—the females and the young being left comparatively but little modified.[59]

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[59] I am greatly indebted to the kindness of Mr. Sclater for having looked over these four chapters on birds, and the two following ones on mammals. By this means I have been saved from making mistakes about the names of the species, and from giving any facts which are actually known to this distinguished naturalist to be erroneous. But of course he is not at all answerable for the accuracy of the statements quoted by me from various authorities.

CHAPTER XVII.

SECONDARY SEXUAL CHARACTERS OF MAMMALS.

The Law of Battle.—Special Weapons, confined to the Males.—Cause of Absence of Weapons in the Female.—Weapons common to both Sexes, yet primarily acquired by the Male.—Other Uses of such Weapons.—Their High Importance.—Greater Size of the Male.—Means of Defence.—On the Preference shown by either Sex in the Pairing of Quadrupeds.

WITH mammals the male appears to win the female much more through the law of battle than through the display of his charms. The most timid animals, not provided with any special weapons for fighting, engage in desperate conflicts during the season of love. Two male hares have been seen to fight together until one was killed; male moles often fight, and sometimes with fatal results; male squirrels "engage in frequent contests, and often wound each other severely;" as do male beavers, so that "hardly a skin is without scars."[1] I observed the same fact with the hides of the guanacoes in Patagonia; and on one occasion several were so absorbed in fighting that they fearlessly rushed close by me. Livingstone speaks of the males of the many animals in Southern

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[1] See Waterton's account of two hares fighting, 'Zoologist,' vol. i. 1843, p. 211. On moles, Bell, 'Hist. of British Quadrupeds,' 1st edit. p. 100. On squirrels, Audubon and Bachman, 'Viviparous Quadrupeds of North America,' 1846, p. 269. On beavers, Mr. A. H. Green, in 'Journal of Lin. Soc. Zoolog.' vol. x. 1869, p. 362.

Africa as almost invariably showing the scars received in former contests.

The law of battle prevails with aquatic as with terrestrial mammals. It is notorious how desperately male seals fight, both with their teeth and claws, during the breeding-season; and their hides are likewise often covered with scars. Male sperm-whales are very jealous at this season; and in their battles "they often lock their jaws together, and turn on their sides and twist about;" so that it is believed by some naturalists that the frequently deformed state of their lower jaws is caused by these struggles.[2]

All male animals which are furnished with special weapons for fighting, are well known to engage in fierce battles. The courage and the desperate conflicts of stags have often been described; their skeletons have been found in various parts of the world, with the horns inextricably locked together, showing how miserably the victor and vanquished had perished.[3] No animal in the world is so dangerous as an elephant in must. Lord Tankerville has given me a graphic description of the battles between the wild-bulls in Chillingham Park, the descendants, degenerated in size but not in courage, of the gigantic *Bos primigenius*. In 1861 several contended for mastery; and it was observed that two of the younger bulls attacked in concert the old leader of the herd, overthrew and disabled him, so that he was believed by the keepers to be lying mortally wounded in a neighboring wood. But a few days afterward one of the young bulls singly approached the wood; and then the "monarch of the chase," who had been lashing himself up for vengeance, came out, and in a short time killed his antagonist. He then quietly joined the herd, and long held undisputed sway. Admiral Sir B. J. Sulivan informs me that when he resided in the Falkland Islands he imported a young English stallion, which, with eight mares, frequented the hills near Port William. On these hills there were two wild stallions, each with a small troop of mares; "and it is certain that these stallions would never have approached each other without fighting. Both had tried singly to fight the English horse and drive away his mares, but had failed. One day they came in *together* and attacked him. This was seen by the captain who had charge of the horses, and who, on riding to the spot, found one of the two stallions engaged with the English horse, while the other was driving away the mares, and had already separated four from the rest. The captain settled the matter by driving the whole party into the corral, for the wild-stallions would not leave the mares."

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[2] On the battles of seals, see Captain C. Abbott in 'Proc. Zool. Soc.' 1868, p. 191; also Mr. H. Brown, ibid. 1869, p. 436; also L. Lloyd, 'Game-Birds of Sweden,' 1867, p. 412; also Pennant. On the sperm-whale, see Mr. J. H. Thompson, in 'Proc. Zool. Soc.' 1867, p. 246.

[3] See Scrope ('Art of Deer-stalking,' p. 17) on the locking of the horns with the Cervus elaphus. Richardson, in 'Fauna Bor. Americana,' 1829, p. 252, says that the wapiti, moose, and reindeer, have been found thus locked together. Sir A. Smith found at the Cape of Good Hope the skeletons of two gnus in the same condition.

Male animals already provided with efficient cutting or tearing teeth for the ordinary purposes of life, as in the carnivora, insectivora, and rodents, are seldom furnished with weapons especially adapted for fighting with their rivals. The case is very different with the males of many other animals. We see this in the horns of stags and of certain kinds of antelopes in which the females are hornless. With many animals the canine teeth in the upper or lower jaw, or in both, are much larger in the males than in the females; or are absent in the latter, with the exception sometimes of a hidden rudiment. Certain antelopes, the musk-deer, camel, horse, boar, various apes, seals, and the walrus, offer instances of these several cases.

In the females of the walrus the tusks are sometimes quite absent.[4] In the male elephant of India and in the male dugong[5] the upper incisors form offensive weapons. In the male narwhal one alone of the upper teeth is developed into the well-known, spirally-twisted, so-called horn, which is sometimes from nine to ten feet in length. It is believed that the males use these horns for fighting together; for "an unbroken one can rarely be got, and occasionally one may be found with the point of another jammed into the broken place."[6] The tooth on the opposite side of the head in the male consists of a rudiment about ten inches in length, which is embedded in the jaw. It is not, however, very uncommon to find double-horned male narwhals in which both teeth are well developed. In the females both teeth are rudimentary. The male cachalot has a larger head than that of the female, and it no doubt aids these animals in their aquatic battles. Lastly, the adult male ornithorhynchus is provided with a remarkable apparatus, namely, a spur on the fore-leg, closely resembling the poison-fang of a venomous snake; its use is not known, but we may suspect that it serves as a weapon of offence.[7] It is represented by a mere rudiment in the female.

When the males are provided with weapons which the females do not possess, there can hardly be a doubt that they are used for fighting with other males, and that they have been acquired through sexual selection. It is not probable, at least in most cases, that the females have actually been saved from acquiring such weapons, owing to their being useless and superfluous, or in some way injurious. On the contrary, as they are often used by the males of many animals for various purposes, more especially as a defence against their enemies, it is a surprising fact that they are so poorly developed or quite absent in the females. No doubt with female deer the development during each recurrent season of great branching horns, and with female elephants the development of immense tusks, would have been a great waste of vital power, on the admission that they were of no use to the females. Consequently variations in the size of these organs, leading to their suppression, would have come under the control of natural selection, and, if limited in their transmission to the female offspring, would not have interfered with their development through sexual selection in the males. But how on this view can we explain the presence of horns in the females of certain antelopes, and of tusks in the females of many animals, which are only of slightly less size than in the males? The explanation in almost all cases must, I believe, be sought in the laws of transmission.

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[4] Mr. Lamont ('Seasons with the Sea-Horses,' 1861, p. 143) says that a good tusk of the male walrus weighs four pounds, and is longer than that of the female, which weighs about three pounds. The males are described as fighting ferociously. On the occasional absence of the tusks in the female, see Mr. R. Brown, 'Proc. Zool. Soc.' 1868, p. 429.

[5] Owen, 'Anatomy of Vertebrates,' vol. iii. p. 283.

[6] Mr. R. Brown, in 'Proc. Zool. Soc.' 1869, p. 553.

[7] Owen on the Cachalot and Ornithorhynchus, ibid. vol. iii. pp. 638, 641

As the reindeer is the single species in the whole family of Deer in which the female is furnished with horns, though somewhat smaller, thinner, and less branched than in the male, it might naturally be thought that they must be of some special use to her. There is, however, some evidence opposed to this view. The female retains her horns from the time when they are fully developed, namely, in September, throughout the winter, until May, when she brings forth her young; while the male casts his horns much earlier, toward the end of November. As both sexes have the same requirements and follow the same habits of life, and as the male sheds his horns during the winter, it is very improbable that they can be of any special service to the female at this season, which includes the larger proportion of the time during which she bears horns. Nor is it probable that she can have inherited horns from some ancient progenitor of the whole family of deer, for, from the fact of the males alone of so many species in all quarters of the globe possessing horns, we may conclude that this was the primordial character of the group. Hence it appears that horns must have been transferred from the male to the female at a period subsequent to the divergence of the various species from a common stock; but that this was not effected for the sake of giving her any special advantage.[8]

We know that the horns are developed at a most unusually early age in the reindeer; but what the cause of this may have been is not known. The effect, however, has apparently been the transference of the horns to both sexes. It is intelligible, on the hypothesis of pangenesis, that a very slight change in the constitution of the male, either in the tissues of the forehead or in the gemmules of the horns, might lead to their early development; and, as the young of both sexes have nearly the same constitution before the period of reproduction, the horns, if developed at an early age in the male, would tend to be developed equally in both sexes. In support of this view, we should bear in mind that the horns are always transmitted through the female, and that she has a latent capacity for their development, as we see in old or diseased females.[9] Moreover the females of some other species of deer, either normally or occasionally, exhibit rudiments of horns; thus the female of *Cervulus moschatus* has "bristly tufts, ending in a knob, instead of a horn;" and "in most specimens of the female Wapiti (*Cervus Canadensis*) there is a sharp bony protuberance in the place of the horn."[10] From these several considerations we may conclude that the possession of fairly well-developed horns by the female reindeer, is due to the males having first acquired them as weapons for fighting with other males; and, secondarily, to their development from some unknown cause at an unusually early age in the males, and their consequent transmission to both sexes.

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[8] On the structure and shedding of the horns of the reindeer, Hoffberg, 'Amœnitates Acad.' vol. iv. 1788, p. 149. See Richardson, 'Fauna Bor. Americana,' p. 241, in regard to the American variety or species; also Major W. Ross King, 'The Sportsman in Canada,' 1866, p. 80.

[9] Isidore Geoffroy St.-Hilaire, 'Essais de Zoolog. Générale,' 1841, p 513. Other masculine characters, besides the horns, are sometimes similarly transferred to the female; thus Mr. Boner, in speaking of an old

Turning to the sheath-horned ruminants: with antelopes a graduated series can be formed, beginning with the species, the females of which are completely destitute of horns—passing to those which have horns so small as to be almost rudimentary, as in *Antilocapra Americana*—to those which have fairly well-developed horns, but manifestly smaller and thinner than in the male, and sometimes of a different shape,[11] and ending with those in which both sexes have horns of equal size. As with the reindeer, so with antelopes, there exists a relation between the period of the development of the horns and their transmission to one or both sexes; it is therefore probable that their presence or absence in the females of

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female chamois ('Chamois Hunting in the Mountains of Bavaria,' 1860, 2d edit. p. 363), says, "not only was the head very male-looking, but along the back there was a ridge of long hair, usually to be found only in bucks."

[10] On the Cervulus, Dr. Gray, 'Catalogue of the Mammalia in British Museum,' part iii. p. 220. On the *Cervus Canadensis* or Wapiti see Hon. J. D. Caton, 'Ottawa Acad. of Nat. Sciences,' May, 1868, p. 9.

[11] For instance, the horns of the female *Ant. Euchore* resemble those of a distinct species, viz. the *Ant. Dorcas* var. *Corine*, see Desmarest, 'Mammalogie,' p. 455.

some species, and their more or less perfect condition in the females of other species, depend, not on their being of some special use, but simply on the form of inheritance which has prevailed. It accords with this view that even in the same restricted genus both sexes of some species, and the males alone of other species, are thus provided. It is a remarkable fact that, although the females of *Antilope bezoartica* are normally destitute of horns, Mr. Blyth has seen no less than three females thus furnished; and there was no reason to suppose that they were old or diseased. The males of this species have long, straight, spirated horns, nearly parallel to each other, and directed backward. Those of the female, when present, are very different in shape, for they are not spirated, and, spreading widely, bend round, so that their points are directed forward. It is a still more remarkable fact that in the castrated male, as Mr. Blyth informs me, the horns are of the same peculiar shape as in the female, but longer and thicker. In all cases the differences between the horns of the males and females, and of castrated and entire males, probably depend on various causes—on the more or less complete transference of male characters to the females—on the former state of the progenitors of the species—and partly, perhaps, on the horns being differently nourished, in nearly the same manner as the spurs of the domestic cock, when inserted into the comb or other parts of the body, assume various abnormal forms from being differently nourished.

In all the wild species of goats and sheep the horns are larger in the male than in the female, and are sometimes quite absent in the latter.[12] In several domestic breeds of the sheep and goat, the males alone are furnished with horns; and it is a significant fact that, in one such breed of sheep on the Guinea coast, the horns are not devel oped, as Mr. Winwood Reade informs me, in the castrated male; so that they are affected in this respect like the horns of stags. In some breeds, as in that of North Wales, in which both sexes are properly horned, the ewes are very liable to be hornless. In these same sheep, as I have been informed by a trustworthy witness who purposely inspected a flock during the lambing-season, the horns at birth are generally more fully developed in the male than in the female. With the adult musk-ox (*Ovibos moschatus*) the horns of the male are larger than those of the female, and in the latter the bases do not touch.[13] In regard to ordinary cattle Mr. Blyth remarks: "In most of the wild bovine animals the horns are both longer and thicker in the bull than in the cow, and in the cow-banteng (*Bos sondaicus*) the horns are remarkably small, and inclined much backward. In the domestic races of cattle, both of the humped and humpless types, the horns are short and thick in the bull, longer and more slender in the cow and ox; and in the Indian buffalo they are shorter and thicker in the bull, longer and more slender in the cow. In the wild-gaour (*B. gaurus*) the horns are mostly both longer and thicker in the bull than in the cow."[14] Hence with most sheath-horned ruminants the horns of the male are either longer or stronger than those of the female. With the *Rhinoceros simus*, as I may here add, the horns of the female are generally longer but less powerful than in the male; and in some other species of rhinoceros they are said to be shorter in the female.[15] From these various facts we may conclude that horns of all kinds, even when equally developed in both sexes, were primarily acquired by the males in order to conquer other males, and have been transferred more or less completely to the female, in relation to the force of the equal form of inheritance.

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[12] Gray, 'Catalogue Mamm. Brit. Mus.' part iii. 1852, p. 160.

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[13] Richardson, 'Fauna Bor. Americana,' p. 278.

[14] 'Land and water,' 1867, p. 346.

[15] Sir Andrew Smith, 'Zoology of South Africa,' pl. xix. Owen, 'Anatomy of Vertebrates,' vol. iii. p. 624.

The tusks of the elephant, in the different species or races, differ according to sex, in nearly the same manner as the horns of ruminants. In India and Malacca the males alone are provided with well-developed tusks. The elephant of Ceylon is considered by most naturalists as a distinct race, but by some as a distinct species, and here "not one in a hundred is found with tusks, the few that possess them being exclusively males."[16] The African elephant is undoubtedly distinct, and the female has large, well-developed tusks, though not so large as those of the male. These differences in the tusks of the several races and species of elephants—the great variability of the horns of deer, as notably in the wild-reindeer—the occasional presence of horns in the female *Antilope bezoartica*—the presence of two tusks in some few male narwhals—the complete absence of tusks in some female walruses—are all instances of the extreme variability of secondary sexual characters, and of their extreme liability to differ in closely-allied forms.

Although tusks and horns appear in all cases to have been primarily developed as sexual weapons, they often serve for other purposes. The elephant uses his tusks in attacking the tiger; according to Bruce, he scores the trunks of trees until they can be easily thrown down, and he likewise thus extracts the farinaceous cores of palms; in Africa he often uses one tusk, this being always the same, to probe the ground and thus to ascertain whether it will bear his weight. The common bull defends the herd with his horns; and the elk in Sweden has been known, according to Lloyd, to strike a wolf dead with a single blow of his great horns. Many similar facts could be given. One of the most curious secondary uses to which the horns of any animal are occasionally put, is that observed by Captain Hutton,[17] with the wild-goat (*Capra ægagrus*) of the Himalayas, and, as it is said, with the ibex, namely, that when the male accidentally falls from a height, he bends inward his head, and, by alighting on his massive horns, breaks the shock. The female cannot thus use her horns, which are smaller, but from her more quiet disposition she does not so much need this strange kind of shield.

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[16] Sir J. Emerson Tennent, 'Ceylon,' 1859, vol. ii. p. 274. For Malacca, 'Journal of Indian Archipelago,' vol. iv. p. 357.

Each male animal uses his weapons in his own peculiar fashion. The common ram makes a charge and butts with such force with the bases of his horns, that I have seen a powerful man knocked over as easily as a child. Goats and certain species of sheep, for instance the *Ovis cycloceros* of Afghanistan,[18] rear on their hind-legs, and then not only butt, but "make a cut down and a jerk up, with the ribbed front of their scimitar-shaped horn, as with a sabre. When the *O. cycloceros* attacked a large domestic ram, who was a noted bruiser, he conquered him by the sheer novelty of his mode of fighting, always closing at once with his adversary, and catching him across the face and nose with a sharp drawing jerk of his head, and then bounding out of the way before the blow could be returned." In Pembrokeshire a male goat, the master of a flock which during several generations had run wild, was known to have killed several other males in single combat; this goat possessed enormous horns, measuring thirty-nine inches in a straight line from tip to tip. The common bull, as every one knows, gores and tosses his opponent; but the Italian buffalo is said never to use his horns, he gives a tremendous blow with his convex forehead, and then tramples on his fallen enemy with his knees—an instinct which the common bull does not possess.[19] Hence a dog who pins a buffalo by the nose is immediately crushed. We must, however, remember that the Italian buffalo has long been domesticated, and it is by no means certain that the wild parent-form had similarly shaped horns. Mr. Bartlett informs me that when a female Cape buffalo (*Bubalus Caffer*) was turned into an enclosure with a bull of the same species, she attacked him, and he in return pushed her about with great violence. But it was manifest to Mr. Bartlett that had not the bull shown dignified forbearance, he could easily have killed her by a single lateral thrust with his immense horns. The giraffe uses his short hair-covered horns, which are rather longer in the male than in the female, in a curious manner; for with his long neck he swings his head to either side, almost upside down, with such force, that I have seen a hard plank deeply indented by a single blow.

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[17] 'Calcutta Journal of Nat. Hist.' vol. ii. 1843, p. 526.

[18] Mr. Blyth, in 'Land and Water,' March, 1867, p. 134, on the authority of Captain Hutton and others. For the wild Pembrokeshire goats see the 'Field,' 1869, p. 150.

With antelopes it is sometimes difficult to imagine how they can possibly use their curiously-shaped horns; thus the spring-boc (*Ant. euchore*) has rather short upright horns, with the sharp points bent inward almost at a right angle, so as to face each other; Mr. Bartlett does not know how they are used, but suggests that they would inflict a fearful wound down each side of the face of an antagonist. The slightly-curved horns of the *Oryx leucoryx* (Fig. 61) are directed backward, and are of such length that their points reach beyond the middle of the back, over which they stand in an almost parallel line. Thus they seem singularly ill-fitted for fighting; but Mr.

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[19] M. E. M. Bailly, "Sur l'usage des Cornes," etc., 'Annal. des Sc. Nat.' tom. ii. 1824, p. 369.

Bartlett informs me that when two of these animals prepare for battle, they kneel down, with their heads between their front legs, and in this attitude the horns stand nearly parallel and close to the ground, with the points directed forward and a little upward. The combatants then gradually approach each other and endeavor to get the upturned points under each other's bodies; if one succeeds in doing this he suddenly springs up, throwing up his head at the same time, and can thus wound or perhaps even transfix his antagonist. Both animals always kneel down so as to guard as far as possible against this manœuvre. It has been recorded that one of these antelopes has used his horns with effect even against a lion; yet, from being forced to place his head between the forelegs in order to bring the points of the horns forward, he would generally be under a great disadvantage when attacked by any other animal. It is, therefore, not probable that the horns have been modified into their present great length and peculiar position, as a protection against beasts of prey. We can, however, see that as soon as

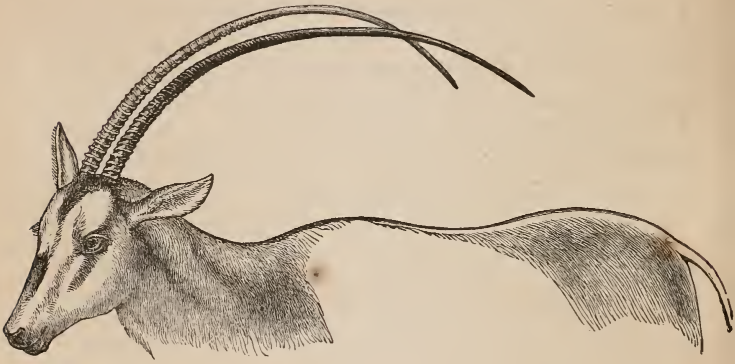

FIG. 61.—Oryx leucoryx, male (from the Knowsley Menagerie).

some ancient male progenitor of the Oryx acquired moderately long horns, directed a little backward, he would be compelled in his battles with rival males to bend his head somewhat inward or downward, as is now done by certain stags; and it is not improbable that he might have acquired the habit of at first occasionally and afterward of regularly kneeling down. In this case it is almost certain that the males which possessed the longest horns would have had a great advantage over others with shorter horns; and then the horns would gradually have been rendered longer and longer, through sexual selection, until they acquired their present extraordinary length and position.

With stags of many kinds the branching of the horns offers a curious case of difficulty; for certainly a single straight point would inflict a much more serious wound than several diverging points. In Sir Philip Egerton's museum there is a horn of the red-deer (*Cervus elaphus*) thirty inches in length, with "not fewer than fifteen snags or branches;" and at Moritzburg there is still preserved a pair of antlers of a red-deer, shot in 1699 by Frederick I., each of which bears the astonishing number of thirty-three branches. Richardson figures a pair of antlers of the wild-reindeer with twenty-nine points.[20] From the manner in which the horns are branched, and more especially from deer being known occasionally to fight together by kicking with their forefeet,[21] M. Bailly actually came to the conclusion that their horns were more injurious than useful to them! But this author overlooks the pitched battles between rival males. As I felt much perplexed about the use or advantage of the branches, I applied to Mr. McNeill of Colinsay, who has long and carefully observed the habits of red-deer, and he informs me that he has never seen some of the branches brought into action, but that the brow-antlers, from inclining downward, are a great protection to the forehead, and their points are likewise used in attack. Sir Philip Egerton also informs me, in regard both to red-deer and fallow-deer, that when they fight they suddenly dash together, and getting their horns fixed against each other's bodies a desperate struggle ensues. When one is at last forced to yield and turn round, the victor endeavors to plunge his brow-antlers into his defeated foe. It thus appears that the upper branches are used chiefly or exclusively for pushing and fencing. Nevertheless, with some species the upper branches are used as weapons of offence; when a man was attacked by a Wapiti deer (*Cervus Canadensis*) in Judge Caton's park in Ottawa, and several men tried to rescue him, the stag "never raised his head from the ground; in fact he kept his face almost flat on the ground, with his nose nearly between his forefeet, except when he rolled his head to one side to take a new observation preparatory to a plunge." In this position the terminal points of the horns were directed against his adversaries. "In rolling his head he necessarily raised it somewhat, because his antlers were so long that he could not roll his head without raising them on one side, while on the other side they touched the ground." The stag by this procedure gradually drove the party of rescuers backward, to a

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[20] Owen, on the Horns of Red-deer, 'British Fossil Mammals,' 1846 p. 478; 'Forest Creatures,' by Charles Boner, 1861, pp. 62, 76. Richardson on the Horns of the Reindeer, 'Fauna Bor. Americana,' 1829, p. 240.

[21] Hon J D. Caton ('Ottawa Acad. of Nat. Science,' May, 1868, p 9), says that the American deer fight with their forefeet, after "the question of superiority has been once settled and acknowledged in the herd"

Bailly, "Sur l'usage des Cornes," 'Annales des Sc. Nat.' tom. ii. 1824, p. 371.

distance of 150 or 200 feet; and the attacked man was killed.[22]

Although the horns of stags are efficient weapons, there can, I think, be no doubt that a single point would have been much more dangerous than a branched antler; and Judge Caton, who has had large experience with deer, fully concurs in this conclusion. Nor do the branching horns, though highly important as a means of defence against rival stags, appear perfectly well adapted for this purpose, as they are liable to become interlocked. The suspicion has therefore crossed my mind that they may serve partly as ornaments. That the branched antlers of stags, as well as the elegant lyrated horns of certain antelopes, with their graceful double curvature (Fig. 62), are ornamental in our eyes, no one will dispute. If, then, the horns, like the splendid accoutrements of the knights of old, add to the noble appearance of stags and antelopes, they may have been partly modified for this purpose, though mainly for actual service in battle; but I have no evidence in favor of this belief.

An interesting case has lately been published, from which it appears that the horns of a deer in one district in the United States are now being modified through sexual and natural selection. A writer in an excellent American journal[23] says that he has hunted for the last twenty-one years in the Adirondacks, where the *Cervus Virginianus* abounds. About fourteen years ago he first heard of *spike-horn bucks*. These became from year to year more common; about five years ago he shot one, and subsequently another, and now they are frequently killed. "The spike-horn differs greatly from the common antler of the *C. Virginianus*. It consists of a single spike, more slender than the antler, and scarcely half so long, projecting forward from the brow, and terminating in a very

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[22] See a most interesting account in the Appendix to Hon. J. D. Caton's paper, as above quoted.

[23] The American Naturalist,' Dec. 1869, p. 552.

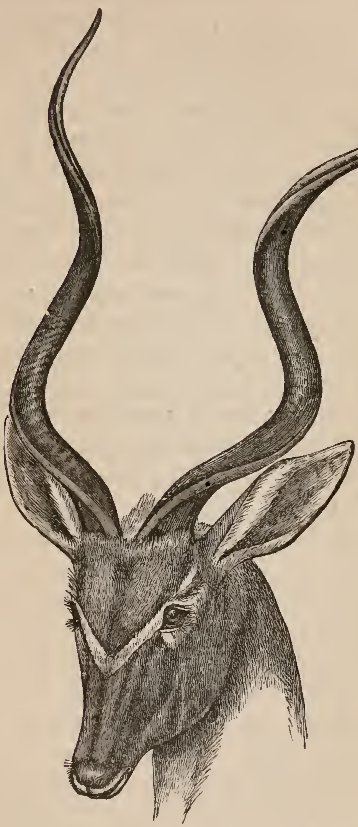

FIG. 62.—Strepsiceros Kudu (from Andrew Smith's 'Zoology of South Africa')

sharp point. It gives a considerable advantage to its possessor over the common buck. Besides enabling him to run more swiftly through the thick woods and under-brush (every hunter knows that does and yearling bucks run much more rapidly than the large bucks when armed with their cumbrous antlers), the spike-horn is a more effective weapon than the common antler. With this advantage the spike-horn bucks are gaining upon the common bucks, and may, in time, entirely supersede them in the Adirondacks. Undoubtedly the first spike-horn buck was merely an accidental freak of Nature. But his spike-horns gave him an advantage, and enabled him to propagate his peculiarity. His descendants, having a like advantage, have propagated the peculiarity in a constantly increasing ratio, till they are slowly crowding the antlered deer from the region they inhabit."

Male quadrupeds which are furnished with tusks use them in various ways, as in the case of horns. The boar strikes laterally and upward; the musk-deer with serious effect downward.[24] The walrus, though having so short a neck and so unwieldy a body, "can strike either upward, or downward, or sideways, with equal dexterity."[25] The Indian elephant fights, as I was informed by the late Dr. Falconer, in a different manner according to the position and curvature of his tusks. When they are directed forward and upward he is able to fling a tiger to a great distance—it is said to even thirty feet; when they are short and turned downward he endeavors suddenly to pin the tiger to the ground, and in consequence is dangerous to the rider, who is liable to be jerked off the hoodah.[26]

Very few male quadrupeds possess weapons of two distinct kinds specially adapted for fighting with rival males. The male muntjac-deer (*Cervulus*), however, offers an exception, as he is provided with horns and exserted canine teeth. But one form of weapon has often been replaced in the course of ages by another form, as we may infer from what follows. With ruminants the development of horns generally stands in an inverse relation with that of even moderately well-developed canine teeth. Thus camels, guanacoes, chevrotains, and musk-deer, are hornless, and they have efficient canines; these teeth being "always of smaller size in the females than in the males." The Camelidæ have in their upper jaws, in addition to their true canines, a pair of canine-shaped incisors.[27] Male deer and antelopes, on the other hand, possess horns, and they rarely have canine teeth; and these when present are always of small size, so that it is doubtful whether they are of any service in their battles. With *Antilope montana* they exist only as rudiments in the young male, disappearing as he grows old; and they are absent in the female at all ages; but the females of certain other antelopes and deer have been known occasionally to exhibit rudiments of these teeth.[28] Stallions have small canine teeth, which are either quite absent or rudimentary in the mare; but they do not appear to be used in fighting, for stallions bite with their incisors, and do not open their mouths widely like camels and guanacoes. Whenever the adult male possesses canines now in an inefficient state, while the female has either none or mere rudiments, we may conclude that the early male progenitor of the species was provided with efficient canines, which had been partially transferred to the females. The reduction of these teeth in the males seems to have followed from some change in their manner of fighting, often caused (but not in the case of the horse) by the development of new weapons.

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[24] Pallas, 'Spicilegia Zoologica,' fasc. xiii. 1779, p. 18.

[25] Lamont, 'Seasons with the Sea-Horses,' 1861, p. 141.

[26] See also Corse ('Philosoph. Transact.' 1799, p. 212) on the manner in which the short-tusked Mooknah variety of the elephant attacks other elephants.

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[27] Owen, 'Anatomy of Vertebrates,' vol. iii. p. 349.

[28] See Rüppell (in 'Proc. Zoolog. Soc.' Jan. 12, 1836, p. 3) on the canines in deer and antelopes, with a note by Mr. Martin on a female American deer. See also Falconer ('Palæont. Memoirs and Notes,' vol. i. 1868, p. 576) on canines in an adult female deer. In old males of the musk-deer the canines (Pallas, 'Spic. Zoolog.' fasc. xiii. 1779, p. 18) sometimes grow to the length of three inches, while in old females a rudiment projects scarcely half an inch above the gums.

Tusks and horns are manifestly of high importance to their possessors, for their development consumes much organized matter. A single tusk of the Asiatic elephant —one of the extinct woolly species—and of the African elephant, have been known to weigh respectively 150, 160, and 180 pounds; and even greater weights have been assigned by some authors.[29] With deer, in which the horns are periodically renewed, the drain on the constitution must be greater; the horns, for instance, of the moose weigh from fifty to sixty pounds, and those of the extinct Irish elk from sixty to seventy pounds—the skull of the latter weighing on an average only five and a quarter pounds. With sheep, although the horns are not periodically renewed, yet their development, in the opinion of many agriculturists, entails a sensible loss to the breeder. Stags, moreover, in escaping from beasts of prey, are loaded with an additional weight for the race, and are greatly retarded in passing through a woody country. The moose, for instance, with horns extending five and a half feet from tip to tip, although so skilful in their use that he will not touch or break a dead twig when walking quietly, cannot act so dexterously while rushing away from a pack of wolves. "During his progress he holds his nose up, so as to lay the horns horizontally back; and in this attitude cannot see the ground distinctly."[30] The tips of the horns of the great Irish elk were actually eight feet apart! While the horns are covered with velvet, which lasts with the red-deer for about twelve weeks, they are extremely sensitive to a blow; so that in Germany the stags at this time change their habits to a certain extent, and avoid dense forests, frequenting young woods and low thickets.[31] These facts remind us that male birds have acquired ornamental plumes at the cost of retarded flight, and other ornaments at the cost of some loss of power in their battles with rival males.

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[29] Emerson Tennent, 'Ceylon,' 1859, vol. ii. p. 275; Owen, 'British Fossil Mammals,' 1846, p. 245.

[30] Richardson, 'Fauna Bor. Americana,' on the moose, *Alces palmata*, p. 236, 237; also, on the expanse of the horns, 'Land and Water,' 1869, p. 143. See also Owen, 'British Fossil Mammals,' on the Irish elk, pp. 447, 455.

With quadrupeds, when, as is often the case, the sexes differ in size, the males are, I believe, always larger and stronger. This holds good in a marked manner, as I am informed by Mr. Gould, with the marsupials of Australia, the males of which appear to continue growing until an unusually late age. But the most extraordinary case is that of one of the seals (*Callorhinus ursinus*), a full-grown female weighing less than one-sixth of a full-grown male.[32] The greater strength of the male is invariably displayed, as Hunter long ago remarked,[33] in those parts of the body which are brought into action in fighting with rival males—for instance, in the massive neck of the bull. Male quadrupeds are also more courageous and pugnacious than the females. There can be little doubt that these characters have been gained, partly through sexual selection, owing to a long series of victories by the stronger and more courageous males over the weaker, and partly through the inherited effects of use. It is probable that the successive variations in strength, size, and courage, whether due to so-called spontaneous variability or to the effects of use, by the accumulation of which, male quadrupeds have acquired these characteristic qualities, occurred rather late in life, and were consequently to a large extent limited in their transmission to the same sex.

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[31] 'Forest Creatures,' by C. Boner, 1861, p. 60.

[32] See the very interesting paper by Mr. J. A Allen in 'Bull. Mus. Comp. Zoolog. of Cambridge, United States,' vol. ii. No. 1, p. 82. The weights were ascertained by a careful observer, Captain Bryant.

[33] 'Animal Economy,' p. 45.

Under this point of view I was anxious to obtain information in regard to the Scotch deer-hound, the sexes of which differ more in size than those of any other breed (though blood-hounds differ considerably), or than in any wild canine species known to me. Accordingly, I applied to Mr. Cupples, a well-known breeder of these dogs, who has weighed and measured many of his own dogs, and who, with great kindness, has collected for me the following facts from various sources. Superior male dogs, measured at the shoulder, range from twenty-eight inches, which is low, to thirty-three or even thirty-four inches in height; and in weight from eighty pounds, which is low, to one hundred and twenty, or even more pounds. The females range in height from twenty-three to twenty-seven or even twenty-eight inches; and in weight from fifty to seventy, or even eighty pounds.[34] Mr. Cupples concludes that from ninety-five to one hundred pounds for the male, and seventy for the female, would be a safe average; but there is reason to believe that formerly both sexes attained a greater weight. Mr. Cupples has weighed puppies when a fortnight old; in one litter the average weight of four males exceeded that of two females by six and a half ounces; in another litter the average weight of four males exceeded that of one female by less than one ounce; the same males, when three weeks old, exceeded the female by seven and a half ounces, and at the age of six weeks by nearly fourteen ounces. Mr. Wright, of Yeldersley House, in a letter to Mr. Cupples, says: "I have taken notes on the sizes and weights of puppies of many litters, and, as far as my experience goes, dog-puppies as a rule differ very little from bitches till they arrive at about five or six months old; and then the dogs begin to increase, gaining upon the bitches both in weight and size. At birth, and for several weeks afterward, a bitch-puppy will occasionally be larger than any of the dogs, but they are invariably beaten by them later." Mr. McNeill, of Colinsay, concludes that "the males do not attain their full growth till over two years old, though the females attain it sooner." According to Mr. Cupples's experience, male dogs go on growing in stature till they are from twelve to eighteen months old, and in weight till from eighteen to twenty-four months old; while the females cease increasing in stature at the age of from nine to fourteen or fifteen months, and in weight at the age of from twelve to fifteen months. From these various statements it is clear that the full difference in size between the male and female Scotch deer-hound is not acquired until rather late in life. The males are almost exclusively used for coursing, for, as Mr. McNeill informs me, the females have not sufficient strength and weight to pull down a full-grown deer. From the names used in old legends, it appears, as I hear from Mr. Cupples, that at a very ancient period the males were the most celebrated, the females being mentioned only as the mothers of famous dogs. Hence, during many generations, it is the male which has been chiefly tested for strength, size, speed, courage, and the best will have been bred from. As, however, the males do not attain their full dimensions until a rather late period in life, they will have tended, in accordance with the law often indicated, to transmit their characters to their male offspring alone; and thus the great inequality in size between the sexes of the Scotch deer-hound may probably be accounted for.

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[34] See also Richardson's 'Manual on the Dog,' p. 59. Much valuable information on the Scottish deer-hound is given by Mr. McNeill, who first called attention to the inequality in size between the sexes, in Scrope's 'Art of Deer Stalking.' I hope that Mr. Cupples will keep to his intention of publishing a full account and history of this famous breed.

The males of some few quadrupeds possess organs or parts developed solely as a means of defence against the attacks of other males. Some kinds of deer use, as we have seen, the upper branches of their horns chiefly or exclusively for defending themselves; and the Oryx antelope, as I am informed by Mr. Bartlett, fences most skilfully with his long, gently-curved horns; but these are likewise used as organs of offence. Rhinoceroses, as the same observer remarks, in fighting parry each other's sidelong blows with their horns, which loudly clatter together, as do the tusks of boars. Although wild-boars fight desperately together, they seldom, according to Brehm, receive fatal blows, as these fall on each other's tusks, or on the layer of gristly skin covering the shoulder, which the German hunters call the shield; and here we have a part specially modified for defence. With boars in the prime of life (see Fig. 63) the tusks in the lower jaw are used for fighting, but they become in old age, as Brehm states, so much curved inward and upward, over the snout, that they can no longer be thus used. They may, however, still continue to serve, and even in a still more effective manner, as a means of defence. In compensation for the loss of the lower tusks as weapons of offence, those in the upper jaw, which always project a

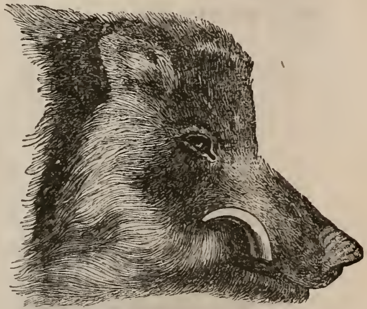

Fig. 63.—Head of common-wild boar, in prime of life (from Brehm).

little laterally, increase so much in length during old age, and curve so much upward, that they can be used as a means of attack. Nevertheless an old boar is not so dangerous to man as one at the age of six or seven years.[35]

In the full-grown male Babirusa pig of Celebes (Fig. 64), the lower tusks are formidable weapons, like those of the European boar in the prime of life, while the upper tusks are so long and have their points so much curled inward, sometimes even touching the forehead, that they are utterly useless as weapons of attack. They more nearly resemble horns than teeth, and are so manifestly useless as teeth that the animal was formerly supposed to rest his head by hooking them on to a branch. Their convex

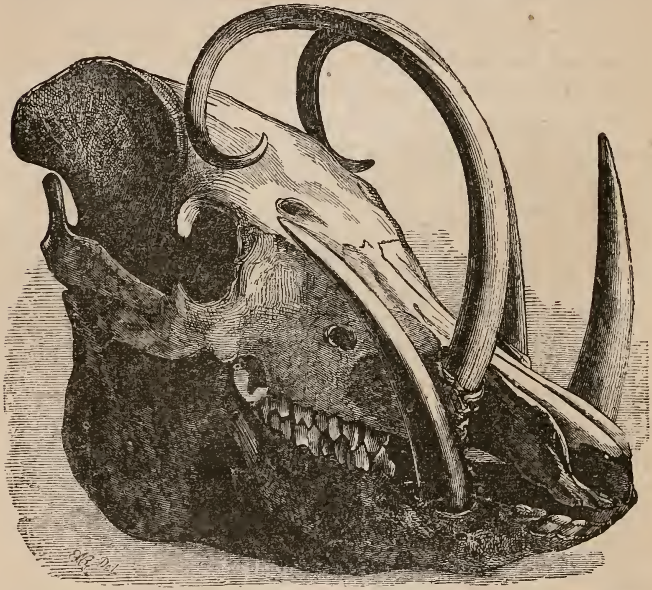

FIG. 64.—Skull of the Babirusa Pig (from Wallace's 'Malay Archipelago').

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[35] Brehm, 'Thierleben,' B. ii. s. 729, 732.

surfaces would, however, if the head were held a little laterally, serve as an excellent guard; and hence, perhaps, it is that in old animals they "are generally broken off, as if by fighting."[36] Here, then, we have the curious case of the upper tusks of the Babirusa regularly assuming, during the prime of life, a structure which apparently renders them fitted only for defence; while in the European boar the lower and opposite tusks assume in a less degree and only during old age nearly the same form, and then serve in like manner solely for defence.

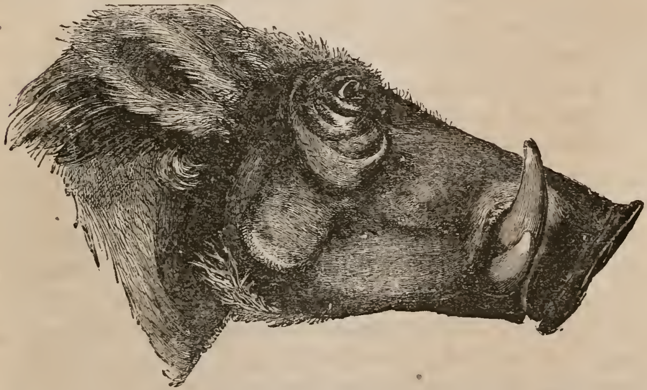

FIG. 65.—Head of Ethiopian Wart-hog, from 'Proc. Zool. Soc.' 1869. (I now find that this drawing represents the head of a female, but it serves to show, on a reduced scale, the characters of the male.)

In the wart-hog (*Phacochoerus æthiopicus*, Fig. 65) the tusks in the upper jaw of the male curve upward during the prime of life, and, from being pointed, serve as formidable weapons. The tusks in the lower jaw are sharper than those in the upper, but from their shortness it seems hardly possible that they can be used as weapons of attack. They must, however, greatly strengthen those in the upper jaw, from being ground so as to fit closely against their bases. Neither the upper nor the lower tusks appear to have been specially modified to act as guards, though, no doubt, they are thus used to a certain extent. But the wart-hog is not destitute of other special means of protection, for there exists, on each side of the face, beneath the eyes, a rather stiff, yet flexible, cartilaginous, oblong pad (Fig. 65), which projects two or three inches outward; and it appeared to Mr. Bartlett and myself, when viewing the living animal, that these pads, when struck from beneath by the tusks of an opponent, would be turned upward, and would thus protect in an admirable manner the somewhat prominent eyes. These boars, as I may add on the authority of Mr. Bartlett, when fighting together, stand directly face to face.

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[36] See Mr. Wallace's interesting account of this animal, 'The Malay Archipelago,' 1869, vol. i. p. 435.

Lastly, the African river-hog (*Potamochoerus penicillatus*) has a hard cartilaginous knob on each side of the face beneath the eyes, which answers to the flexible pad of the wart-hog; it has also two bony prominences on the upper jaw above the nostrils. A boar of this species in the Zoological Gardens recently broke into the cage of the wart-hog. They fought all night-long, and were found in the morning much exhausted, but not seriously wounded. It is a significant fact, as showing the purpose of the above-described projections and excrescences, that these were covered with blood, and were scored and abraded in an extraordinary manner.

The mane of the lion forms a good defence against the one danger to which he is liable, namely, the attacks of rival lions: for the males, as Sir. A. Smith informs me, engage in terrible battles, and a young lion dares not approach an old one. In 1857 a tiger at Bromwich broke into the cage of a lion, and a fearful scene ensued; "the lion's mane saved his neck and head from being much injured, but the tiger at last succeeded in ripping up his belly, and in a few minutes he was dead."[37] The broad ruff round the throat and chin of the Canadian lynx (*Felis Canadensis*) is much longer in the male than in the female; but whether it serves as a defence I do not know. Male seals are well known to fight desperately together, and the males of certain kinds (*Otaria jubata*)[38] have great manes, while the females have small ones or none. The male baboon of the Cape of Good Hope (*Cynocephalus porcarius*) has a much longer mane and larger canine teeth than the female; and the mane probably serves as a protection, for on asking the keepers in the Zoological Gardens, without giving them any clew to my object, whether any of the monkeys especially attacked each other by the nape of the neck, I was answered that this was not the case, excepting with the above baboon. In the Hamadryas baboon, Ehrenberg compares the mane of the adult male to that of a young lion, while in the young of both sexes and in the female the mane is almost absent.

It appeared to me probable that the immense woolly mane of the male American bison, which reaches almost to the ground, and is much more developed in the males than in the females, served as a protection to them in their terrible battles; but an experienced hunter told Judge Caton that he had never observed any thing which favored this belief. The stallion has a thicker and fuller mane than the mare; and I have made particular inquiries of two great trainers and breeders who have had charge of many entire horses, and am assured that they "invariably endeavor to seize one another by the neck." It does not, however, follow from the foregoing statements, that when the hair on the neck serves as a defence, that it was originally developed for this purpose, though this is probable in some cases, as in that of the lion. I am informed by Mr. McNeill that the long hairs on the throat of the stag (*Cervus elephas*) serve as a great protection to him when hunted, for the dogs generally endeavor to seize him by the throat; but it is not probable that these hairs were specially developed for this purpose; otherwise the young and the females would, as we may feel assured, have been equally protected.

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[37] 'The Times,' Nov. 10, 1857. In regard to the Canada lynx, see Audubon and Bachman, 'Quadrupeds of North America,' 1846, p. 139.

[38] Dr. Murie, on Otaria, 'Proc. Zoolog. Soc.' 1869, p. 109. Mr. J. A. Allen, in the paper above quoted (p. 75), doubts whether the hair, which is longer on the neck in the male than in the female, deserves to be called a mane.

On Preference or Choice in Pairing, as shown by either Sex of Quadrupeds.—Before describing, in the next chapter, the differences between the sexes in voice, odor emitted, and ornamentation, it will be convenient here to consider whether the sexes exert any choice in their unions. Does the female prefer any particular male, either before or after the males may have fought together for supremacy; or does the male, when not a polygamist, select any particular female? The general impression among breeders seems to be that the male accepts any female; and this, owing to his eagerness, is in most cases probably the truth. Whether the female as a general rule indifferently accepts any male is much more doubtful. In the fourteenth chapter, on Birds, a considerable body of direct and indirect evidence was advanced, showing that the female selects her partner; and it would be a strange anomaly if female quadrupeds, which stand higher in the scale of organization and have higher mental powers, did not generally, or at least often, exert some choice. The female could in most cases escape, if wooed by a male that did not please or excite her; and when pursued, as so incessantly occurs, by several males, she would often have the opportunity, while they were fighting together, of escaping with, or at least of temporarily pairing with, some one male. This latter contingency has often been observed in Scotland with female red-deer, as I have been informed by Sir Philip Egerton.[39]

It is scarcely possible that much should be known about female quadrupeds exerting in a state of nature any choice in their marriage unions. The following very curious details on the courtship of one of the eared seals *Callorhinus ursinus*, are given[40] on the authority of Captain Bryant, who had ample opportunities for observation. He says: "Many of the females on their arrival at the island where they breed appear desirous of returning to some particular male, and frequently climb the outlying rocks to overlook the rookeries, calling out and listening as if for a familiar voice. Then, changing to another place, they do the same again . . . . As soon as a female reaches the shore, the nearest male goes down to meet her, making meanwhile a noise like the clucking of a hen to her chickens. He bows to her and coaxes her until he gets between her and the water so that she cannot escape him. Then his manner changes, and with a harsh growl he drives her to a place in his harem. This continues until the lower row of harems is nearly full. Then the males higher up select the time when their more fortunate neighbors are off their guard to steal their wives. This they do by taking them in their mouths and lifting them over the heads of the other females, and carefully placing them in their own harem, carrying them as cats do their kittens. Those still higher up pursue the same method until the whole space is occupied Frequently a struggle ensues between the two males for the possession of the same female, and both seizing her at once pull her in two or terribly lacerate her with their teeth. When the space is all filled, the old male walks around complacently reviewing his family, scolding those who crowd or disturb the others, and fiercely driving off all intruders. This surveillance always keeps him actively occupied."

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[39] Mr. Boner in his excellent description of the habits of the red-deer in Germany ('Forest Creatures,' 1861, p. 81) says, "While the stag is defending his rights against one intruder, another invades the sanctuary of his harem, and carries off trophy after trophy." Exactly the same thing occurs with seals, see Mr. J. A. Allen, ibid. p. 100.

[40] Mr. J. A. Allen in 'Bull. Mus. Comp. Zoolog. of Cambridge, United States,' vol. ii. No. 1, p. 99.

As so little is known about the courtship of animals in a state of nature, I have endeavored to discover how far our domesticated quadrupeds evince any choice in their unions. Dogs offer the best opportunity for observation, as they are carefully attended to and well understood. Many breeders have expressed a strong opinion on this head. Thus Mr. Mayhew remarks, "The females are able to bestow their affections; and tender recollections are as potent over them as they are known to be in other cases, where higher animals are concerned. Bitches are not always prudent in their loves, but are apt to fling themselves away on curs of low degree. If reared with a companion of vulgar appearance, there often springs up between the pair a devotion which no time can afterward subdue. The passion, for such it really is, becomes of a more than romantic endurance." Mr. Mayhew, who attended chiefly to the smaller breeds, is convinced that the females are strongly attracted by males of large size.[41] The well-known veterinary Blaine states[42] that his own female pug became so attached to a spaniel, and a female setter to a cur, that in neither case would they pair with a dog of their own breed until several weeks had elapsed. Two similar and trustworthy accounts have been given me in regard to a female retriever and a spaniel, both of which became enamoured with terrier-dogs.

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[41] 'Dogs: their Management,' by E. Mayhew, M. R. C. V. S., 2d edit. 1864, pp. 187–192.

[42] Quoted by Alex. Walker 'On Intermarriage,' 1838, p. 276; see also p. 244.

Mr. Cupples informs me that he can personally vouch for the accuracy of the following more remarkable case, in which a valuable and wonderfully-intelligent female terrier loved a retriever, belonging to a neighbor, to such degree that she had often to be dragged away from him. After their permanent separation, although repeatedly thowing milk in her teats, she would never acknowledge she courtship of any other dog, and, to the regret of her owner, never bore puppies. Mr. Cupples also states that a female deer-hound now (1868) in his kennel has thrice produced puppies, and on each occasion showed a marked preference for one of the largest and handsomest, but not the most eager, of four deer-hounds living with her, all in the prime of life. Mr. Cupples has observed that the female generally favors a dog whom she has associated with and knows; her shyness and timidity at first incline her against a strange dog. The male, on the contrary, seems rather inclined toward strange females. It appears to be rare when the male refuses any particular female, but Mr. Wright, of Yeldersley House, a great breeder of dogs, informs me that he has known some instances; he cites the case of one of his own deer-hounds, who would not take any notice of a particular female mastiff, so that another deer-hound had to be employed. It would be superfluous to give other cases, and I will only add that Mr. Barr who has carefully bred many blood-hounds, states that in almost every instance particular individuals of the opposite sex show a decided preference for each other. Finally Mr. Cupples, after attending to this subject for another year, has recently written to me: "I have had full confirmation of my former statements, that dogs in breeding form decided preferences for each other, being often influenced by size, bright color, and individual character, as well as by the degree of their previous familiarity."

In regard to horses, Mr. Blenkiron, the greatest breeder of race-horses in the world, informs me that stallions are so frequently capricious in their choice, rejecting one mare and without any apparent cause taking to another, that various artifices have to be habitually used. The famous Monarque, for instance, would never consciously look at the dam of Gladiateur, and a trick had to be practised. We can partly see the reason why valuable race horse stallions, which are in such demand, should be so particular in their choice. Mr. Blenkiron has never known a mare to reject a horse; but this has occurred in Mr. Wright's stable, so that the mare had to be cheated. Prosper Lucas[43] quotes various statements from French authorities, and remarks, "On voit des étalons qui s'éprennent d'une jument, et négligent toutes les autres." He gives, on the authority of Baëlen, similar facts in regard to bulls. Hoffberg, in describing the domesticated reindeer of Lapland, says, "Fæmine majores et fortiores mares præ cæteris admittunt, ad eos confugiunt, a junioribus agitatæ, qui hos in fugam conjiciunt."[44] A clergyman, who has bred many pigs, assures me that sows often reject one boar and immediately accept another.

From these facts there can be no doubt that with most of our domesticated quadrupeds strong individual antipathies and preferences are frequently exhibited, and much more commonly by the female than by the male. This being the case, it is improbable that the unions of quadrupeds in a state of nature should be left to mere chance. It is much more probable that the females are allured or excited by particular males, who possess certain characters in a higher degree than other males; but what these characters are, we can seldom or never discover with certainty.

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[43] Traité de l'Héréd. Nat.' tom. ii. 1850, p. 296.

[44] 'Amœnitates Acad.' vol. iv. 1788, p. 160.

CHAPTER XVIII.

SECONDARY SEXUAL CHARACTERS OF MAMMALS—*continued.*

Voice.—Remarkable Sexual Peculiarities in Seals.—Odor.—Development of the Hair.—Color of the Hair and Skin.—Anomalous Case of the Female being more ornamented than the Male.—Color and Ornaments due to Sexual Selection.—Color acquired for the Sake of Protection.—Color, though common to both Sexes, often due to Sexual Selection.—On the Disappearance of Spots and Stripes in Adult Quadrupeds.—On the Colors and Ornaments of the Quadrumana.—Summary.

QUADRUPEDS use their voices for various purposes, as a signal of danger, as a call from one member of a troop to another, or from the mother to her lost offspring, or from the latter for protection to their mother; but such uses need not here be considered. We are concerned only with the difference between the voices of the two sexes, for instance, between that of the lion and lioness, or of the bull and cow. Almost all male animals use their voices much more during the rutting-season than at any other time; and some, as the giraffe and porcupine,[1] are said to be completely mute excepting at this season. As the throats (i. e., the larnyx and thyroid bodies[2]) of stags become periodically enlarged at the commencement of the breeding-season, it might be thought that their powerful voices must be then in some way of high importance to them; but this is very doubtful. From information given to me by two experienced observers, Mr. McNeill and Sir P Egerton, it seems that young stags under three years old do not roar or bellow; and that the old ones begin bellowing at the commencement of the breeding-season, at first only occasionally and moderately, while they restlessly wander about in search of the females. Their battles are prefaced by loud and prolonged bellowing, but during the actual conflict they are silent. Animals of all kinds which habitually use their voices, utter various noises under any strong emotion, as when enraged and preparing to fight; but this may merely be the result of their nervous excitement, which leads to the spasmodic contraction of almost all the muscles of the body, as when a man grinds his teeth and clinches his hands in rage or agony. No doubt stags challenge each other to mortal combat by bellowing; but it is not likely that this habit could have led through sexual selection, that is, by the loudest-voiced males having been the most successful in their conflicts, to the periodical enlargement of the vocal organs; for the stags with the most powerful voices, unless at the same time the strongest, best-armed, and most courageous, would not have gained any advantage over their rivals with weaker voices. The stags, moreover, which had weaker voices, though not so well able to challenge other stags, would have been drawn to the place of combat as certainly as those with stronger voices.

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[1] Owen, 'Anatomy of Vertebrates,' vol. iii. p. 585. [2] Ibid. p. 595.

It is possible that the roaring of the lion may be of some actual service to him in striking terror into his adversary; for when enraged he likewise erects his mane and thus instinctively tries to make himself appear as terrible as possible. But it can hardly be supposed that the bellowing of the stag, even if it be of any service to him in this way, can have been important enough to have led to the periodical enlargement of the throat. Some writers suggest that the bellowing serves as a call to the female; but the experienced observers above quoted inform me that female deer do not search for the male, though the males search eagerly for the females, as indeed might be expected from what we know of the habits of other male quadrupeds. The voice of the female, on the other hand, quickly brings to her one or more stags,[3] as is well known to the hunters who in wild countries imitate her cry. If we could believe that the male had the power to excite or allure the female by his voice, the periodical enlargement of his vocal organs would be intelligible on the principle of sexual selection, together with inheritance limited to the same sex and season of the year; but we have no evidence in favor of this view. As the case stands, the loud voice of the stag during the breeding-season does not seem to be of any special service to him, either during his courtship, or battles, or in any other way. But may we not believe that the frequent use of the voice, under the strong excitement of love, jealousy, and rage, continued during many generations, may at last have produced an inherited effect on the vocal organs of the stag, as well as of other male animals? This appears to me, with our present state of knowledge, the most probable view.

The male gorilla has a tremendous voice, and when adult is furnished with a laryngeal sac, as is likewise the adult male orang.[4] The gibbons rank among the noisiest of monkeys, and the Sumatra species (*Hylobates syndactylus*) is also furnished with a laryngeal sac; but Mr. Blyth, who has had opportunities for observation, does not believe that the male is more noisy than the female. Hence, these latter monkeys probably use their voices as a mutual call; and this is certainly the case with some quadrupeds, for instance, with the beaver.[5] Another gibbon, the *H. agilis*, is highly remarkable, from having the power of emitting a complete and correct octave of musical notes,[6] which we may reasonably suspect serves as a sexual charm; but I shall have to recur to this subject in the next chapter. The vocal organs of the American *Mycetes caraya* are one-third larger in the male than in the female, and are wonderfully powerful. These monkeys, when the weather is warm, make the forests resound during the morning and evening with their overwhelming voices. The males begin the dreadful concert, in which the females, with their less powerful voices, sometimes join, and which is often continued during many hours. An excellent observer, Rengger,[7] could not perceive that they were excited to begin their concert by any special cause; he thinks that, like many birds, they delight in their own music, and try to excel each other. Whether most of the foregoing monkeys have acquired their powerful voices in order to beat their rivals and to charm the females—or whether the vocal organs have been strengthened and enlarged through the inherited effects of long-continued use without any particular good being gained —I will not pretend to say; but the former view, at least in the case of the *Hylobates agilis*, seems the most probable.

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[3] See, for instance, Major W. Ross King ('The Sportsman in Canada,' 1866, pp. 53, 131) on the habits of the moose and wild-reindeer.

[4] Owen, 'Anatomy of Vertebrates,' vol. iii. p. 600.

[5] Mr. Green, in 'Journal of Linn. Soc.' vol. x. Zoology, 1869, p. 362.

I may here mention two very curious sexual peculiarities occurring in seals, because they have been supposed by some writers to affect the voice. The nose of the male sea-elephant (*Macrorhinus proboscideus*), when about three years old, is greatly elongated during the breeding-season, and can then be erected. In this state it is sometimes a foot in length. The female at no period of life is thus provided, and her voice is different. That of the male consists of a wild, hoarse, gurgling noise, which is audible at a great distance, and is believed to be strengthened by the proboscis. Lesson compares the erection of the proboscis to the swelling of the wattles of male gallinaceous birds while they court the females. In another allied kind of seal, namely, the bladder-nose (*Cystophora cristata*), the head is covered by a great hood or bladder. This is internally supported by the septum of the nose, which is produced far backward and rises into a crest seven inches in height. The hood is clothed with short hair, and is muscular; it can be inflated until it more than equals the whole head in size! The males when rutting fight furiously on the ice, and their roaring "is said to be sometimes so loud as to be heard four miles off." When attacked by man they likewise roar or bellow; and whenever irritated the bladder is inflated. Some naturalists believe that the voice is thus strengthened, but various other uses have been assigned to this extraordinary structure. Mr. R. Brown thinks that it serves as a protection against accidents of all kinds. This latter view is not probable, if what the sealers have long maintained is correct, namely, that the hood or bladder is very poorly developed in the females and in the males while young.[8]

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[6] C. L. Martin, 'General Introduction to the Nat. Hist. of Mamm. Animals,' 1841, p. 431.

[7] 'Naturgeschichte der Säugethiere von Paraguay,' 1830, s. 15, 21

Odor.—With some animals, as with the notorious skunk of America, the overwhelming odor which they emit appears to serve exclusively as a means of defence. With shrew-mice (Sorex) both sexes possess abdominal scent-glands, and there can be little doubt, from the manner in which their bodies are rejected by birds and beasts of prey, that their odor is protective; nevertheless, the glands become enlarged in the males during the breeding-season. In many quadrupeds the glands are of the same size in both sexes;[9] but their use is not known. In other species the glands are confined to the males, or are more developed in them than in the females; and they almost always become more active during the rutting-season. At this period the glands on the sides of the face of the male elephant enlarge and emit a secretion having a strong musky odor.

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[8] On the sea-elephant, see an article by Lesson, in 'Dict. Class. Hist. Nat.' tom. xiii. p. 418. For the Cystophora or Stemmatopus, see Dr. Dekay, 'Annals of Lyceum of Nat. Hist. New York,' vol. i. 1824, p. 94. Pennant has also collected information from the sealers on this animal. The fullest account is given by Mr. Brown, who doubts about the rudimentary condition of the bladder in the female, in 'Proc. Zoolog. Soc.' 1868, p. 435.

The rank effluvium of the male goat is well known, and that of certain male deer is wonderfully strong and persistent. On the banks of the Plata I have perceived the whole air tainted with the odor of the male *Cervus campestris*, at the distance of half a mile to the leeward of a herd; and a silk handkerchief, in which I carried home a skin, though repeatedly used and washed, retained, when first unfolded, traces of the odor for one year and seven months. This animal does not emit its strong odor until more than a year old, and if castrated while young never emits it.[10] Besides the general odor, with which the whole body of certain ruminants appears to be permeated during the breeding-season, many deer, antelopes, sheep, and goats, possess odoriferous glands in various situations, more especially on their faces. The so-called tear-sacs or suborbital pits come under this head. These glands secrete a semifluid fetid matter, which is sometimes so copious as to stain the whole face, as I have seen in the case of an antelope. They are "usually larger in the male than in the female, and their development is checked by castration."[11] According to Desmarest they are altogether absent in the female of *Antilope subgutturosa.* Hence, there can be no doubt that they stand in some close relation with the reproductive functions. They are also sometimes present, and sometimes absent, in nearly-allied forms. In the adult male musk-deer (*Moschus moschiferus*), a naked space round the tail is bedewed with an odoriferous fluid, while in the adult female, and in the male, until two years old, this space is covered with hair, and is not odoriferous. The proper musk-sac, from its position, is necessarily confined to the male, and forms an additional scent-organ. It is a singular fact that the matter secreted by this latter gland does not, according to Pallas, change in consistence, or increase in quantity, during the rutting-season; nevertheless, this naturalist admits that its presence is in some way connected with the act of reproduction. He gives, however, only a conjectural and unsatisfactory explanation of its use.[12]

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[9] As with the castoreum of the beaver, see Mr. L. H. Morgan's most interesting work, 'The American Beaver,' 1868, p. 300. Pallas ('Spic. Zoolog.' fasc. viii. 1779, p. 23) has well discussed the odoriferous glands of mammals. Owen ('Anat. of Vertebrates,' vol. iii. p. 634) also gives an account of these glands, including those of the elephant, and (p. 763) those of shrew-mice.

[10] Rengger, 'Naturgeschichte der Säugethiere von Paraguay,' 1830, s. 355. This observer also gives some curious particulars in regard to the odor emitted.

In most cases, when during the breeding-season the male alone emits a strong odor, this probably serves to excite or allure the female. We must not judge on this head by our own taste, for it is well known that rats are enticed by certain essential oils, and cats by valerian, substances which are far from agreeable to us; and that dogs, though they will not eat carrion, sniff and roll in it.

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[11] Owen, 'Anatomy of Vertebrates,' vol. iii. p. 632. See, also, Dr Murie's observations on their glands in 'Proc. Zoolog. Soc.' 1870, p. 34(Desmarest, on the *Antilope subgutturosa*, 'Mammalogie,' 1820, p 455.

[12] Pallas, 'Spicilegia Zoolog.' fasc. xiii. 1799, p. 24; Desmoulin, Dict. Class. d'Hist. Nat.' tom. iii. p. 586.

From the reasons given when discussing the voice of the stag, we may reject the idea that the odor serves to bring the females from a distance to the males. Active and long-continued use cannot here have come into play, as in the case of the vocal organs. The odor emitted must be of considerable importance to the male, inasmuch as large and complex glands, furnished with muscles for everting the sac, and for closing or opening the orifice, have in some cases been developed. The development of these organs is intelligible through sexual selection, if the more odoriferous males are the most successful in winning the females, and in leaving offspring to inherit their gradually-perfected glands and odors.

Development of the Hair.—We have seen that male quadrupeds often have the hair on their necks and shoulders much more developed than in the females; and many additional instances could be given. This sometimes serves as a defence to the male during his battles; but whether the hair in most cases has been specially developed for this purpose is very doubtful. We may feel almost certain that this is not the case, when a thin and narrow crest runs along the whole length of the back; for a crest of this kind would afford scarcely any protection, and the ridge of the back is not a likely place to be injured; nevertheless such crests are sometimes confined to the males, or are much more developed in them than in the females. Two antelopes, the *Tragelaphus scriptus*[13] (see Fig. 68, p. 285) and *Portax picta*, may be given as instances. The crests of certain stags and of the male wild-goat stand erect, when these animals are enraged or terrified;[14] but it can hardly be supposed that they have been acquired for the sake of exciting fear in their enemies. One of the above-named antelopes, the *Portax picta*, has a large, well-defined brush of black hair on the throat, and this is much larger in the male than in the female. In the *Ammotragus tragelaphus* of North Africa, a member of the sheep family, the front-legs are almost concealed by an extraordinary growth of hair, which depends from the neck and upper halves of the legs; but Mr. Bartlett does not believe that this mantle is of the least use to the male, in whom it is much more developed than in the female.

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[13] Dr. Gray, 'Gleanings from the Menagerie at Knowsley,' pl. 28.

[14] Judge Caton on the wapiti, 'Transact. Ottawa Acad. Nat. Sciences,' 1868, pp. 36, 40; Blyth, 'Land and Water,' on *Capra ægagrus*, 1867, p. 37.

Male quadrupeds of many kinds differ from the females in having more hair, or hair of a different character, on certain parts of their faces. The bull alone has curled hair on the forehead.[15] In three closely-allied subgenera of the goat family, the males alone possess beards, sometimes of a large size; in two other subgenera both sexes have a beard, but this disappears in some of the domestic breeds of the common goat; and neither sex of the Hemitragus has a beard. In the ibex the beard is not developed during the summer, and is so small at other seasons that it may be called rudimentary.[16] With some monkeys the beard is confined to the male, as in the Orang, or is much larger in the male than in the female, as in the *Mycetes caraya* and *Pithecia satanas* (Fig. 66). So it is with the whiskers of some species of Macacus,[17] and, as we have seen, with the manes of some species of baboons. But with most kinds of monkeys the various tufts of hair about the face and head are alike in both sexes.

The males of various members of the Ox family (Bovidæ), and of certain antelopes, are furnished with a dewlap, or great fold of skin on the neck, which is much less developed in the female.

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[15] 'Hunter's Essays and Observations,' edited by Owen, 1861, vol. i. p 236.

[16] See Dr. Gray's 'Cat. of Mammalia in British Museum,' part iii. 1852, p. 144.

[17] Rengger, 'Säugethiere,' etc., s. 14; Desmarest, 'Mammalogie,' p. 66.

Now, what must we conclude with respect to such sexual differences as these? No one will pretend that the beards of certain male goats, or the dewlap of the bull, or the crests of hair along the backs of certain male antelopes, are of any direct or ordinary use to them. It is possible that the immense beard of the male Pithecia, and the large beard of the male Orang, may protect their throats when fighting; for the keepers in the Zoological Gardens inform me that many monkeys attack each other by the throat: but it is not probable that the beard has

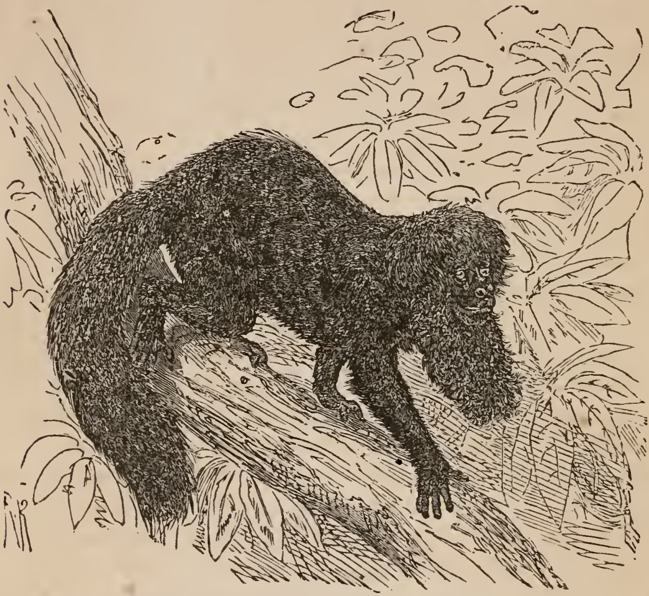
FIG. 66.—Pithecia Satanas, male (from Brehm).

been developed for a distinct purpose from that which the whiskers, mustache, and other tufts of hair on the face, serve; and no one will suppose that these are useful as a protection. Must we attribute to mere purposeless variability in the male all these appendages of hair or skin? It cannot be denied that this is possible; for, with many domesticated quadrupeds, certain characters, apparently not derived through reversion from any wild parent-form, have appeared in, and are confined to, the males, or are more largely developed in them than in the females—for instance, the hump in the male zebu-cattle of India, the tail in fat-tailed rams, the arched outline of the forehead in the males of several breeds of sheep, the mane in the ram of an African breed, and, lastly, the mane, long hairs on the hinder legs, and the dewlap in the male alone, of the Berbura goat.[18] The mane which occurs in the rams alone of the above-mentioned African breed of sheep, is a true secondary sexual character, for it is not developed, as I hear from Mr. Winwood Reade, if the animal be castrated. Although we ought to be extremely cautious, as shown in my work on "Variation under Domestication," in concluding that any character, even with animals kept by semi-civilized people, has not been subjected to selection by man, and thus augmented; yet in the cases just specified this is improbable, more especially as the characters are confined to the males, or are more strongly developed in them than in the females. If it were positively known that the African ram with a mane was descended from the same primitive stock with the other breeds of sheep, or the Berbura male goat with his mane, dewlap, etc., from the same stock with other goats; and if selection has not been applied to these characters, then they must be due to simple variability, together with sexually-limited inheritance.

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[18] See the chapters on these several animals in vol. i. of my 'Variation of Animals under Domestication;' also vol. ii. p. 73; also chap. xx. on the practice of selection by semi-civilized people. For the Berbura goat, see Dr. Gray, 'Catalogue,' ibid. p. 157.

In this case it would appear reasonable to extend the same view to the many analogous characters occurring in animals under a state of nature. Nevertheless, I cannot persuade myself that this view is applicable in many cases, as in that of the extraordinary development of hair on the throat and fore-legs of the male Ammotragus, or of the immense beard of the male Pithecia. With those antelopes in which the male when adult is more strongly colored than the female, and with those monkeys in which this is likewise the case, and in which the hair on the face is of a different color from that on the rest of the head, being arranged in the most diversified and elegant manner, it seems probable that the crests and tufts of hair have been acquired as ornaments; and this I know is the opinion of some naturalists. If this view be correct, there can be little doubt that they have been acquired, or at least modified, through sexual selection.

Color of the Hair and of the Naked Skin.—I will first give briefly all the cases, known to me, of male quadrupeds differing in color from the females. With Marsupials, as I am informed by Mr. Gould, the sexes rarely differ in this respect; but the great red kangaroo offers a striking exception, "delicate blue being the prevailing tint in those parts of the female which in the male are red."[19] In the *Didelphis opossum* of Cayenne the female is said to be a little more red than the male. With Rodents Dr. Gray remarks: "African squirrels, especially those found in the tropical regions, have the fur much brighter and more vivid at some seasons of the year than at others, and the fur of the male is generally brighter than that of the female."[20] Dr. Gray informs me that he specified the African squirrels, because, from their unusually bright colors, they best exhibit this difference. The female of the *Mus minutus* of Russia is of a paler and dirtier tint than the male. In some few bats the fur of the male is lighter and brighter than in the female.[21]

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[19] *Osphranter rufus*, Gould, 'Mammals of Australia,' vol. ii. 1863. On the Didelphis, Desmarest 'Mammalogie,' p. 256.

The terrestrial Carnivora and Insectivora rarely exhibit sexual differences of any kind, and their colors are almost always exactly the same in both sexes. The ocelot (*Felis pardalis*), however, offers an exception, for the colors of the female, compared with those of the male, are "moins apparentes, le fauve étant plus terne, le blanc moins pur, les raies ayant moins de largeur et les taches moins de diamètre."[22] The sexes of the allied *Felis mitis* also differ, but even in a less degree, the general hues of the female being rather paler than in the male, with the spots less black. The marine Carnivora or Seals, on the other hand, sometimes differ considerably in color, and they present, as we have already seen, other remarkable sexual differences. Thus the male of the *Otària nigrescens* of the southern hemisphere is of a rich brown shade above; while the female, who acquires her adult tints earlier in life than the male, is dark gray above, the young of both sexes being of a very deep chocolate color. The male of the northern *Phoca Groenlandica* is tawny gray, with a curious saddle-shaped dark mark on the back; the female is much smaller, and has a very different appearance, being "dull white or yellowish straw-color, with a tawny hue on the back;" the young at first are pure white, and can "hardly be distinguished among the icy hummocks and snow, their color thus acting as a protection." [23]

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[20] 'Annals and Mag. of Nat. Hist.' Nov. 1867, p. 325. On the *Mus minutus*, Desmarest, 'Mammalogie,' p. 304.

[21] J. A. Allen, in 'Bulletin of Mus. Comp. Zoolog. of Cambridge, United States,' 1869, p. 207.

[22] Desmarest, 'Mammalogie,' 1820, p. 223. On *Felis mitis*, Rengger, ibid. s. 194.

With Ruminants sexual differences of color occur more commonly than in any other order. A difference of this kind is general with the Strepsicerene antelopes; thus the male nilghau (*Portax picta*) is bluish-gray and much darker than the female, with the square white patch on the throat, the white marks on the fetlocks, and the black spots on the ears, all much more distinct. We have seen that in this species the crests and tufts of hair are likewise more developed in the male than in the hornless female. The male, as I am informed by Mr. Blyth, without shedding his hair, periodically becomes darker during the breeding-season. Young males cannot be distinguished from young females until above twelve months old; and if the male is emasculated before this period, he never, according to the same authority, changes color. The importance of this latter fact, as distinctive of sexual coloring, becomes obvious, when we hear [24] that neither the red summer-coat nor the blue winter-coat of the Virginian deer is at all affected by emasculation. With most or all of the highly-ornamented species of Tragelaphus the males are darker than the hornless females, and their crests of hair are more fully developed. In the male of that magnificent antelope, the *Derbyan Eland*, the body is redder, the whole neck much blacker, and the white band which separates these colors, broader, than in the female. In the Cape Eland also, the male is slightly darker than the female. [25]

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[23] Dr. Murie on the Otaria, 'Proc. Zool. Soc.' 1869, p. 108. Mr. R. Brown, on the *P. Groenlandica*, ibid. 1868, p. 417. See also on the colors of seals, Desmarest, ibid. pp. 243, 249.

[24] Judge Caton, in 'Trans. Ottawa Acad. of Nat. Sciences.' 1868, p. 4.

[25] Dr. Gray, 'Cat of Mamm. in Brit. Mus.' part iii. 1852, pp. 134–142;

In the Indian Black-buck (*A. bezoartica*), which belongs to another tribe of antelopes, the male is very dark, almost black; while the hornless female is fawn-colored. We have in this species, as Mr. Blyth informs me, an exactly parallel series of facts as with the *Portax picta*, namely, in the male periodically changing color during the breeding-season, in the effects of emasculation on this change, and in the young of both sexes being undistinguishable from each other. In the *Antilope niger* the male is black, the female as well as the young being brown; in *A. sing-sing* the male is much brighter colored than the hornless female, and his chest and belly are blacker; in the male *A. caama*, the marks and lines which occur on various parts of the body are black instead of as in the female brown; in the brindled gnu (*A. gorgon*) "the colors of the male are nearly the same as those of the female, only deeper and of a brighter hue."[26] Other analogous cases could be added.

The Banteng bull (*Bos sondaicus*) of the Malayan archipelago is almost black, with white legs and buttocks; the cow is of a bright dun, as are the young males until about the age of three years, when they rapidly change color. The emasculated bull reverts to the color of the female. The female Kemas goat is paler, and the female *Capra ægagrus* is said to be more uniformly tinted than

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also Dr. Gray, 'Gleanings from the Menagerie of Knowsley,' in which there is a splendid drawing of the Oreas Derbianus: see the text on Tragelaphus. For the Cape Eland (*Oreas canna*), see Andrew Smith, 'Zoology of South Africa,' pls. 41, 42. There are also many of these antelopes in the Zoological Society's Gardens.

[26] On the *Ant. niger*, see 'Proc. Zool. Soc.' 1850, p. 133. With respect to an allied species, in which there is an equal sexual difference in color, see Sir S. Baker, 'The Albert Nyanza,' 1866, vol. ii. p. 327. For the *A. sing-sing*, Gray, 'Cat. B. Mus.' p. 100. Desmarest, 'Mammalogie,' p. 468, on the *A. caama*. Andrew Smith, 'Zoology of South Africa,' on the Gnu.

their respective males. Deer rarely present any sexual differences in color. Judge Caton, however, informs me that with the males of the Wapiti deer (*Cervus Canadensis*) the neck, belly, and legs, are much darker than the same parts in the female; but during the winter the darker tints gradually fade away and disappear. I may here mention that Judge Caton has in his park three races of the Virginian deer, which differ slightly in color, but the differences are almost exclusively confined to the blue winter or breeding coat; so that this case may be compared with those given in a previous chapter of closely-allied or representative species of birds which differ from each other only in their nuptial plumage.[27] The females of *Cervus paludosus* of South America, as well as the young of both sexes, do not possess the black stripes on the nose, and the blackish-brown line on the breast which characterize the adult males.[28] Lastly, the mature male of the beautifully colored and spotted Axis deer is considerably darker, as I am informed by Mr. Blyth, than the female; and this hue the castrated male never acquires.

The last Order which we have to consider—for I am not aware that sexual differences in color occur in the other mammalian groups—is that of the Primates. The male of the *Lemur macaco* is coal-black, while the female is reddish-yellow, but highly variable in color.[29] Of the Quadrumana of the New World, the females and young of *Mycetes caraya* are grayish-yellow and alike; in the second year the young male becomes reddish-brown, in the third year black, excepting the stomach, which, however, becomes quite black in the fourth or fifth year. There is also a strongly-marked difference in color between the sexes in *Mycetes seniculus* and *Cebus capucinus;* the young of the former and I believe of the latter species resembling the females. With *Pithecia leucocephala* the young likewise resemble the females, which are brownish-black above and light rusty-red beneath, the adult males being black. The ruff of hair round the face of *Ateles marginatus* is tinted yellow in the male and white in the female. Turning to the Old World, the males of *Hylobates hoolock* are always black, with the exception of a white band over the brows; the females vary from whity-brown to a dark tint mixed with black, but are never wholly black.[30] In the beautiful *Cercopithecus Diana* the head of the adult male is of an intense black, while that of the female is dark gray; in the former the fur between the thighs is of an elegant fawn-color, in the latter it is paler. In the equally beautiful and curious mustache monkey (*Cercopithecus cephus*) the only difference between the sexes is that the tail of the male is chestnut and that of the female gray; but Mr. Bartlett informs me that all the hues become more strongly pronounced in the male when adult, while in the female they remain as they were during youth. According to the colored figures given by Solomon Müller, the male of *Semnopithecus chrysomelas* is nearly black, the female being pale brown. In the *Cercopithecus cynosurus* and *griseo-viridis* one part of the body which is confined to the male sex is of the most brilliant blue or green, and contrasts strikingly with the naked skin on the hinder part of the body, which is vivid red.

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[27] 'Ottawa Academy of Sciences,' May 21, 1868, pp. 3, 5.

[28] S. Müller, on the Banteng, 'Zoog. Indischen Archipel.' 1839–1844, tab. 35: see also Raffles, as quoted by Mr. Blyth, in 'Land and Water,' 1867, p. 476. On goats, Dr. Gray, 'Cat. Brit. Mus.' p. 146; Desmarest, Mammalogie,' p. 482. On the *Cervus paludosus*, Rengger, ibid. s. 345.

[29] Sclater, 'Proc. Zool. Soc.' 1866, p. 1. The same fact has also been fully ascertained by MM. Pollen and Van Dam.

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[30] On Mycetes, Rengger, ibid. s. 14; and Brehm, 'Illustrirtes Thierleben,' B i. s 96, 107. On Ateles, Desmarest, 'Mammalogie,' p. 75. On Hylobates, Blyth, 'Land and Water,' 1867, p. 135. On the Semnopithecus, S. Müller, 'Zoog. Indischen Archipel.' tab. x.

Lastly, in the Baboon family, the adult male of *Cynocephalus hamadryas* differs from the female not only by his immense mane, but slightly in the color of the hair and of the naked callosities. In the drill (*Cynocephalus leucophœus*) the females and young are much paler-colored, with less green, than the adult males. No other member of the whole class of mammals is colored in so extraordinary a manner as the adult male mandrill (*Cynocephalus mormon*). The face at this age becomes of a fine blue, with the ridge and tip of the nose of the most brilliant red. According to some authors, the face is also marked with whitish stripes, and is shaded in parts with black, but the colors appear to be variable. On the forehead there is a crest of hair, and on the chin a yellow beard. "Toutes les parties supérieures de leurs cuisses et le grand espace nu de leurs fesses sont également colorés du rouge le plus vif, avec un mélange de bleu qui ne manque réellement pas d'élégance."[31] When the animal is excited all the naked parts become much more vividly tinted. Several authors have used the strongest expressions in describing these resplendent colors, which they compare with those of the most brilliant birds. Another most remarkable peculiarity is that when the great canine teeth are fully developed, immense protuberances of bone are formed on each cheek, which are deeply furrowed longitudinally, and the naked skin over them is brilliantly colored, as just described. (Fig. 67.) In the adult females and in the young of both sexes these protuberances are scarcely perceptible; and the naked parts are much less brightly colored, the face being almost black, tinged with blue. In the adult female, however, the nose at certain regular intervals of time becomes tinted with red.

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[31] Gervais, 'Hist. Nat. des Mammifères,' 1854, p. 103. Figures are given of the skull of the male. Desmarest, 'Mammalogie,' p. 70. Geoffroy St.-Hilaire and F. Cuvier, 'Hist. Nat. des Mamm.' 1824, tom. i.

In all the cases hitherto given the male is more strongly or brightly colored than the female, and differs in a greater degree from the young of both sexes. But as a reversed style of coloring is characteristic of the two sexes with some few birds, so with the Rhesus monkey (*Macacus rhesus*) the female has a large surface of naked

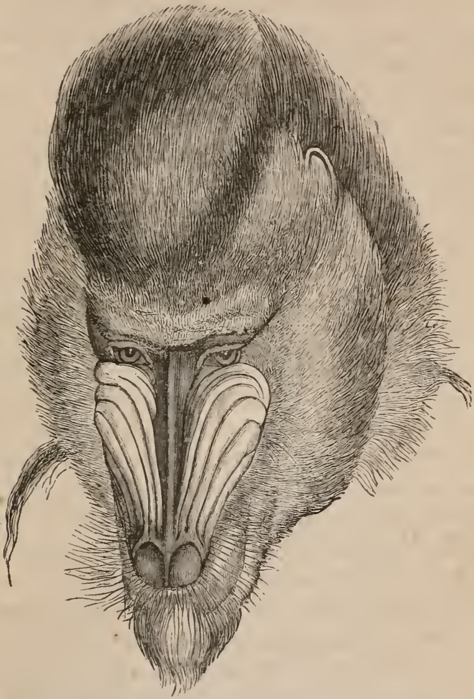

FIG. 67.—Head of male Mandrill (from Gervais 'Hist. Nat des Mammifères').

skin round the tail, of a brilliant carmine red, which periodically becomes, as I was assured by the keepers in the Zoological Gardens, even more vivid, and her face is also pale red. On the other hand, with the adult male and with the young of both sexes, as I saw in the Gardens, neither the naked skin at the posterior end of the body, nor the face, shows a trace of red. It appears, however, from some published accounts, that the male does occasionally, or during certain seasons, exhibit some traces of the red. Although he is thus less ornamented than the female, yet in the larger size of his body, larger canine teeth, more developed whiskers, more prominent superciliary ridges, he follows the common rule of the male excelling the female.

I have now given all the cases known to me of a difference in color between the sexes of mammals. The colors of the female either do not differ in a sufficient degree from those of the male, or are not of a suitable nature to afford her protection, and therefore cannot be explained on this principle. In some, perhaps in many cases, the differences may be the result of variations confined to one sex and transmitted to the same sex, without any good having been thus gained, and therefore without the aid of selection. We have instances of this kind with our domesticated animals, as in the males of certain cats being rusty-red, while the females are tortoise-shell colored. Analogous cases occur under nature: Mr. Bartlett has seen many black varieties of the jaguar, leopard, vulpine, phalanger, and wombat; and he is certain that all, or nearly all, were males. On the other hand, both sexes of wolves, foxes, and apparently of American squirrels, are occasionally born black. Hence it is quite possible that with some mammals the blackness of the males, especially when this color is congenital, may simply be the result, without the aid of selection, of one or more variations having occurred, which from the first were sexually limited in their transmission. Nevertheless, it can hardly be admitted that the diversified, vivid, and contrasted colors of certain quadrupeds, for instance, of the above-mentioned monkeys and antelopes, can thus be accounted for. We should bear in mind that these colors do not appear in the male at birth, as in the case of most ordinary variations, but only at or near maturity; and that, unlike ordinary variations, if the male be emasculated, they never appear or subsequently disappear. It is on the whole a much more probable conclusion that the strongly-marked colors and other ornamental characters of male quadrupeds are beneficial to them in their rivalry with other males, and have consequently been acquired through sexual selection. The probability of this view is strengthened by the differences in color between the sexes occurring almost exclusively, as may be observed by going through the previous details, in those groups and sub-groups of mammals which present other and distinct secondary sexual characters; these being likewise due to the action of sexual selection.

Quadrupeds manifestly take notice of color. Sir S. Baker repeatedly observed that the African elephant and rhinoceros attacked with special fury white or gray horses. I have elsewhere shown [32] that half-wild horses apparently prefer pairing with those of the same color, and that herds of fallow-deer of a different color, though living together, have long kept distinct. It is a more significant fact that a female zebra would not admit the addresses of a male ass until he was painted so as to resemble a zebra, and then, as John Hunter remarks, "she received him very readily. In this curious fact, we have instinct excited by mere color, which had so strong an effect as to get the better of every thing else. But the male did not require this, the female being an animal somewhat similar to himself, was sufficient to rouse him."[33]

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[32] 'The Variation of Animals and Plants under Domestication,' 1868, vol. ii. pp. 102, 103.

In an early chapter we have seen that the mental powers of the higher animals do not differ in kind, though so greatly in degree, from the corresponding powers of man, especially of the lower and barbarous races; and it would appear that even their taste for the beautiful is not widely different from that of the Quadrumana. As the negro of Africa raises the flesh on his face into parallel ridges "or cicatrices, high above the natural surface, which unsightly deformities are considered great personal attractions"[34] —as negroes, as well as savages in many parts of the world, paint their faces with red, blue, white, or black bars —so the male mandrill of Africa appears to have acquired his deeply-furrowed and gaudily-colored face from having been thus rendered attractive to the female. No doubt it is to us a most grotesque notion that the posterior end of the body should have been colored for the sake of ornament even more brilliantly than the face; but this is really not more strange than that the tails of many birds should have been especially decorated.

With mammals we do not at present possess any evidence that the males take pains to display their charms before the female; and the elaborate manner in which this is performed by male birds, is the strongest argument in favor of the belief that the females admire, or are excited by, the ornaments and colors displayed before them. There is, however, a striking parallelism between mammals and birds in all their secondary sexual characters, namely, in their weapons for fighting with rival males, in their ornamental appendages, and in their colors. In both classes, when the male differs from the female, the young of both sexes almost always resemble each other, and in a large majority of cases resemble the adult female. In both classes the male assumes the characters proper to his sex shortly before the age for reproduction; if emasculated he either never acquires such characters or subsequently loses them. In both classes the change of color is sometimes seasonal, and the tints of the naked parts sometimes become more vivid during the act of courtship. In both classes the male is almost always more vividly or strongly colored than the female, and is ornamented with larger crests either of hair or feathers, or other appendages. In a few exceptional cases the female in both classes is more highly ornamented than the male. With many mammals, and at least in the case of one bird, the male is more odoriferous than the female. In both classes the voice of the male is more powerful than that of the female. Considering this parallelism there can be little dcubt that the same cause, whatever it may be, has acted on mammals and birds; and the result, as far as ornamental characters are concerned, may safely be attributed, as it appears to me, to the long-continued preference of the individuals of one sex for certain individuals of the opposite sex, combined with their success in leaving a larger number of offspring to inherit their superior attractions.

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[33] 'Essays and Observations by J. Hunter,' edited by Owen, 1861, vol. i. p. 194.

[34] Sir S. Baker, 'The Nile Tributaries of Abyssinia,' 1867.

Equal Transmission of Ornamental Characters to both Sexes.—With many birds, ornaments, which analogy leads us to believe were primarily acquired by the males, have been transmitted equally, or almost equally, to both sexes: and we may now inquire how far this view may be extended to mammals. With a considerable number of species, especially the smaller kinds, both sexes have been colored, independently of sexual selection, for the sake of protection; but not, as far as I can judge, in so many cases, nor in nearly so striking a manner as in most of the lower classes. Audubon remarks that he often mistook the musk-rat,[35] while sitting on the banks of a muddy stream, for a clod of earth, so complete was the resemblance. The hare on her form is a familiar instance of concealment through color; yet this principle partly fails in a closely-allied species, namely, the rabbit, for, as this animal runs to its burrow, it is made conspicuous to the sportsman and no doubt to all beasts of prey, by its upturned pure-white tail. No one has ever doubted that the quadrupeds which inhabit snow-clad regions have been rendered white to protect them from their enemies, or to favor their stealing on their prey. In regions where snow never lies long on the ground a white coat would be injurious; consequently species thus colored are extremely rare in the hotter parts of the world. It deserves notice that many quadrupeds, inhabiting moderately cold regions, although they do not assume a white winter dress, become paler during this season; and this apparently is the direct result of the conditions to which they have long been exposed. Pallas[36] states that in Siberia a change of this nature occurs with the wolf, two species of Mustela, the domestic horse, the *Equus hemionus*, the domestic cow, two species of antelopes, the musk-deer, the roe, the elk, and reindeer. The roe, for instance, has a red summer and a grayish-white winter coat; and the latter may perhaps serve as a protection to the animal while wandering through the leafless thickets, sprinkled with snow and hoar-frost. If the above-named animals were gradually to extend their range into regions perpetually covered with snow, the pale winter coats would probably be rendered, through natural selection, whiter and whiter by degrees, until they become as white as snow.

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[35] *Fiber zibethicus*, Audubon and Bachman, 'The Quadrupeds of North America,' 1846, p. 109.

[36] 'Novæ species Quadrupedum e Glirium ordine,' 1778, p. 7. What I have called the roe is the *Capreolus Sibiricus subecaudatus* of Pallas.

Although we must admit that many quadrupeds have

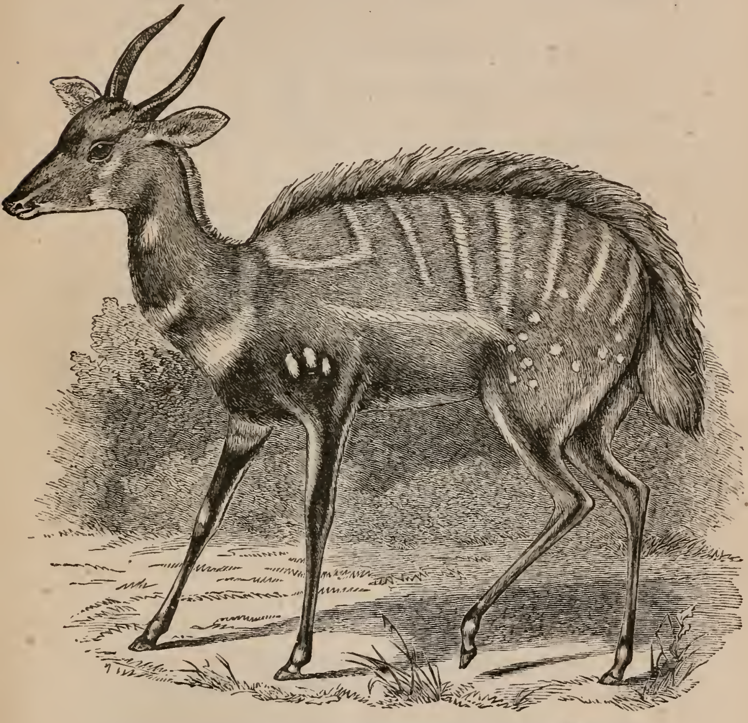

FIG. 68.—Tragelaphus scriptus, male (from the Knowsley Menagerie).

received their present tints as a protection, yet with a host of species the colors are far too conspicuous and too singularly arranged to allow us to suppose that they serve for this purpose. We may take as an illustration certain antelopes: when we see that the square white patch on the throat, the white marks on the fetlocks, and the round black spots on the ears, are all more distinct in the male of the *Portax picta*, than in the female—when we see that the colors are more vivid, that the narrow white lines on the flank and the broad white bar on the shoulder are more distinct in the male *Oreas Derbyanus* than in the female—when we see a similar difference between the sexes of the curiously ornamented *Tragelaphus scriptus* (Fig. 68)—we may conclude that these colors and various marks have been at least intensified through sexual selection. It is inconceivable that such colors and marks can be of any direct or ordinary service to these animals; and

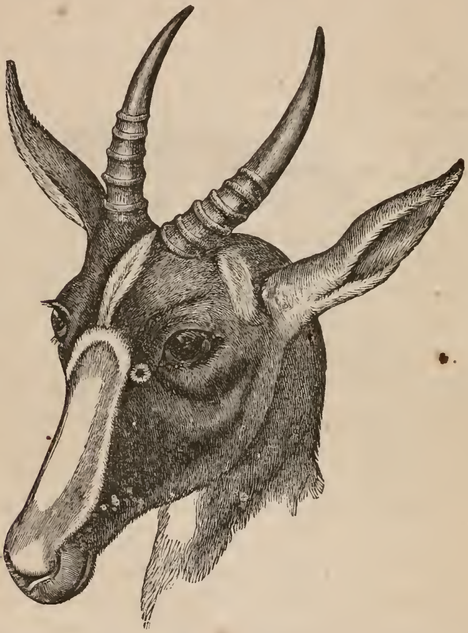

FIG. 69.—Damalis pygarga, male (from the Knowsley Menagerie).

as they have almost certainly been intensified through sexual selection, it is probable that they were originally gained through this same process, and then partially transferred to the females. If this view be admitted, there can be little doubt that the equally singular colors and marks of many other antelopes, though common to both sexes, have been gained and transmitted in a like manner. Both sexes, for instance, of the Koodoo (*Strepsiceros Kudu*, Fig. 62) have narrow white vertical lines on their hinder flanks, and an elegant angular white mark on their foreheads. Both sexes in the genus Damalis are very oddly colored; in *D. pygarga* the back and neck are purplish-red, shading on the flanks into black, and abruptly separated from the white belly and a large white space on the buttocks; the head is still more oddly colored, a large oblong white mask, narrowly edged with black, covers the face up to the eyes (Fig. 69); there are three white stripes on the forehead, and the ears are marked with white. The fawns of this species are of a uniform pale yellowish-brown. In *Damalis albifrons* the coloring of the head differs from that in the last species in a single white stripe replacing the three stripes, and in the ears being almost wholly white.[37] After having studied to the best of my ability the sexual differences of animals belonging to all classes, I cannot avoid the conclusion that the curiously-arranged colors of many antelopes, though common to both sexes, are the result of sexual selection primarily applied to the male.

The same conclusion may perhaps be extended to the tiger, one of the most beautiful animals in the world, the sexes of which cannot be distinguished by color, even by the dealers in wild beasts. Mr. Wallace believes[38] that the striped coat of the tiger "so assimilates with the vertical stems of the bamboo, as to assist greatly in concealing him from his approaching prey." But this view does not appear to me satisfactory. We have some slight evidence that his beauty may be due to sexual selection, for in two species of Felis analogous marks and colors are rather brighter in the male than in the female. The Zebra is conspicuously striped, and stripes on the open plains of South Africa cannot afford any protection. Burchell[39] in describing a herd says, "Their sleek ribs glistened in the sun, and the brightness and regularity of their striped coats presented a picture of extraordinary beauty, in which probably they are not surpassed by any other quadruped." Here we have no evidence of sexual selection, as throughout the whole group of the Equidæ, the sexes are identical in color. Nevertheless, he who attributes the white and dark vertical stripes on the flanks of various antelopes to sexual selection, will probably extend the same view to the Royal Tiger and beautiful Zebra.

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[37] See the fine plates in A. Smith's 'Zoology of South Africa,' and Dr Gray's 'Gleanings from the Menagerie of Knowsley.'

[38] 'Westminster Review,' July 1, 1867, p. 5.

We have seen in a former chapter that when young animals belonging to any class follow nearly the same habits of life with their parents, and yet are colored in a different manner, it may be inferred that they have retained the coloring of some ancient and extinct progenitor. In the family of pigs, and in the genus Tapir, the young are marked with longitudinal stripes, and thus differ from every existing adult species in these two groups. With many kinds of deer the young are marked with elegant white spots, of which their parents exhibit not a trace. A graduated series can be followed from the Axis deer, both sexes of which at all ages and during all seasons are beautifully spotted (the male being rather more strongly colored than the female)—to species in which neither the old nor the young are spotted. I will specify some of the steps in this series. The Mantchurian deer (*Cervus Mantchuricus*) is spotted during the whole year, but the spots are much plainer, as I have seen in the Zoological Gardens, during the summer, when the general color of the coat is lighter than during the winter, when the general color is darker and the horns are fully developed. In the hog-deer (*Hyelaphus porcinus*) the spots are extremely conspicuous during the summer when the coat is reddish-brown, but quite disappear during the winter when the coat is brown.[40] In both these species the young are spotted. In the Virginian deer the young are likewise spotted, and about five per cent. of the adult animals living in Judge Caton's park, as I am informed by him, temporarily exhibit at the period when the red summer-coat is being replaced by the bluish winter-coat, a row of spots on each flank, which are always the same in number, though very variable in distinctness. From this condition there is but a very small step to the complete absence of spots at all seasons in the adults; and lastly, to their absence at all ages, as occurs with certain species. From the existence of this perfect series, and more especially from the fawns of so many species being spotted, we may conclude that the now living members of the deer family are the descendants of some ancient species which, like the Axis deer, was spotted at all ages and seasons. A still more ancient progenitor probably resembled to a certain extent the *Hyomoschus aquaticus* —for this animal is spotted, and the hornless males have large exserted canine teeth, of which some few true deer still retain rudiments. It offers, also, one of those interesting cases of a form linking together two groups, as it is intermediate in certain osteological characters between the pachyderms and ruminants, which were formerly thought to be quite distinct.[41]

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[39] 'Travels in South Africa,' 1824, vol. ii. p. 315.

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[40] Dr. Gray, 'Gleanings from the Menagerie of Knowsley,' p. 64. Mr. Blyth, in speaking ('Land and Water,' 1869, p. 42) of the hog-deer of Ceylon, says it is more brightly spotted with white than the common hog-deer, at the season when it renews its horns.

A curious difficulty here arises. If we admit that colored spots and stripes have been acquired as ornaments, how comes it that so many existing deer, the descendants of an aboriginally spotted animal, and all the species of pigs and tapirs, the descendants of an aboriginally striped animal, have lost in their adult state their former ornaments? I cannot satisfactorily answer this question. We may feel nearly sure that the spots and stripes disappeared in the progenitors of our existing species at or near maturity, so that they were retained by the young, and, owing to the law of inheritance at corresponding ages, by the young of all succeeding generations. It may have been a great advantage to the lion and puma, from the open nature of the localities which they commonly haunt, to have lost their stripes, and to have been thus rendered less conspicuous to their prey; and if the successive variations, by which this end was gained, occurred rather late in life, the young would have retained their stripes, as we know to be the case. In regard to deer, pigs, and tapirs, Fritz Müller has suggested to me that these animals, by the removal through natural selection of their spots or stripes, would have been less easily seen by their enemies; and they would have especially required this protection, as soon as the carnivora increased in size and number during the Tertiary periods. This may be the true explanation, but it is rather strange that the young should not have been equally well protected, and still more strange that with some species the adults should have retained their spots, either partially or completely, during part of the year. We know, though we cannot explain the cause, that when the domestic ass varies and becomes reddish-brown, gray or black, the stripes on the shoulders and even on the spine frequently disappear. Very few horses, except dun-colored kinds, exhibit stripes on any part of their bodies, yet we have good reason to believe that the aboriginal horse was striped on the legs and spine, and probably on the shoulders.[42] Hence the disappearance of the spots and stripes in our adult existing deer, pigs, and tapirs, may be due to a change in the general color of their coats; but whether this change was effected through sexual or natural selection, or was due to the direct action of the conditions of life, or some other unknown cause, it is impossible to decide. An observation made by Mr. Sclater well illustrates our ignorance of the laws which regulate the appearance and disappearance of stripes; the species of Asinus which inhabit the Asiatic continent are destitute of stripes, not having even the cross shoulder-stripe, while those which inhabit Africa are conspicuously striped, with the partial exception of *A. tæniopus*, which has only the cross shoulder-stripe and generally some faint bars on the legs; and this species inhabits the almost intermediate region of Upper Egypt and Abyssinia.[43]

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[41] Falconer and Cautley, 'Proc. Geolog. Soc.' 1843; and Falconer's Pal. Memoirs,' vol. i. p. 196.

Quadrumana.—Before we conclude, it will be advisable to add a few remarks to those already given on the ornamental characters of monkeys. In most of the species the sexes resemble each other in color, but in some, as we have seen, the males differ from the females, especially in the color of the naked parts of the skin, in the development of the beard, whiskers, and mane. Many species are colored either in so extraordinary or beautiful a manner, and are furnished with such curious and elegant crests of hair, that we can hardly avoid looking at these characters as having been gained for the sake of ornament. The accompanying figures (Figs. 70 to 74) serve to show the arrangement of the hair on the face and head in several species. It is scarcely conceivable that these crests of hair and strongly-contrasted colors of the fur and skin can be the result of mere variability without the aid of selection; and it is inconceivable that they can be of any ordinary use to these animals. If so, they have probably been gained through sexual selection, though transmitted equally, or almost equally, to both sexes.

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[42] 'The Variation of Animals and Plants under Domestication,' 1868, vol. i. pp. 61–64.

[43] 'Proc. Zool. Soc.' 1862, p. 164. See, also, Dr. Hartmann, 'Ann. d. Landw.' Bd. xliii. s. 222.

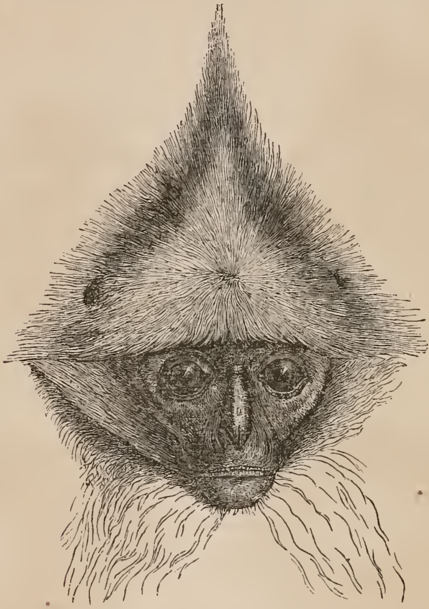

FIG. 70.—Head of Semnopithecus rubicundus. This and the following figures (from Prof. Gervais) are given to show the odd arrangement and development of the hair on the head.

With many of the Quadrumana, we have additional evidence of the action of sexual selection in the greater size and strength of the males, and in the greater development of their canine teeth, in comparison with the females.

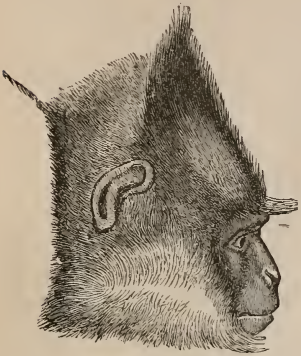

Fig 71.—Head of Semnopithecus comatus.

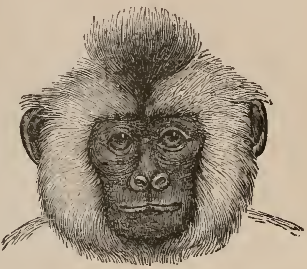

Fig. 72.—Head of Cebus capucinus.

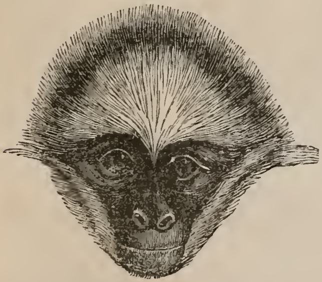

Fig. 73.—Head of Ateles marginatus.

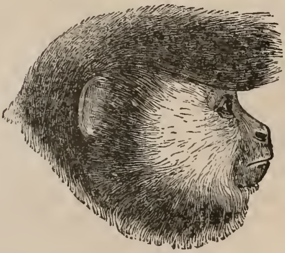

Fig. 74.—Head of Cebus vellerosus.

With respect to the strange manner in which both sexes of some species are colored, and of the beauty of others, a few instances will suffice. The face of the *Cercopithecus petaurista* (Fig. 75) is black, the whiskers and beard being white, with a defined, round, white spot on the nose, covered with short white hair, which gives to the animal an almost ludicrous aspect. The *Semnopithe-*

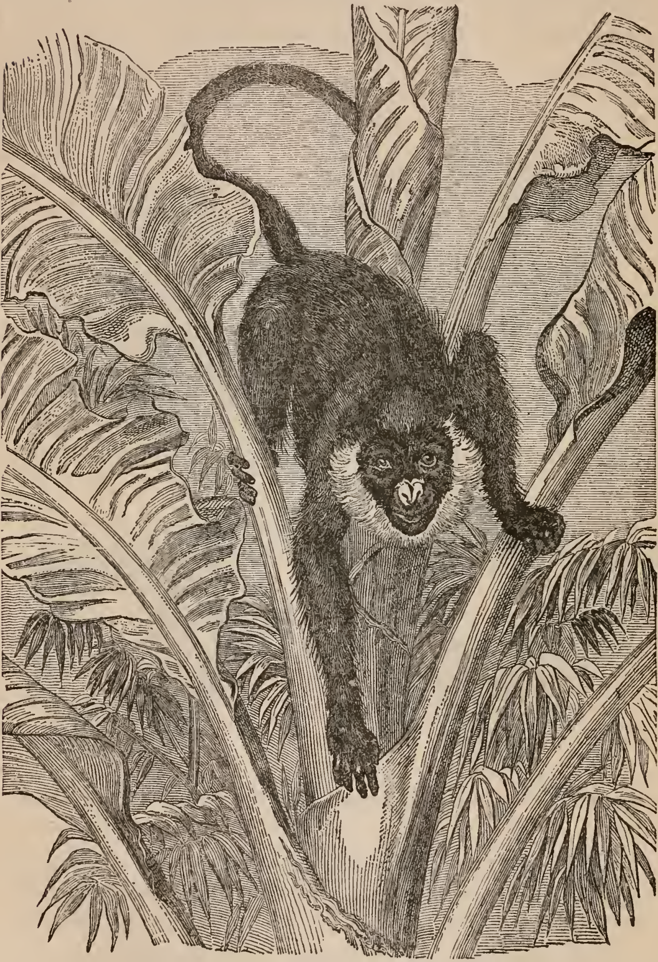

FIG. 75.—Cercopithecus petaurista (from Brehm).

cus frontatus likewise has a blackish face with a long black beard, and a large naked spot on the forehead of a bluish-white color. The face of *Macacus lasiotus* is dirty flesh-colored, with a defined red spot on each cheek. The appearance of *Cercocebus Æthiops* is grotesque, with its black face, white whiskers and collar, chestnut head, and a large naked white spot over each eyelid. In very many species, the beard, whiskers, and crests of hair round the face, are of a different color from the rest of the head, and, when different, are always of a lighter tint,[44] being often pure white, sometimes bright yellow, or reddish. The whole face of the South-American *Brachyurus calvus* is of a "glowing scarlet hue;" but this color does not appear until the animal is nearly mature.[45] The naked skin of the face differs wonderfully in color in the various species. It is often brown or flesh-color, with parts perfectly white, and often as black as that of the most sooty negro. In the Brachyurus, the scarlet tint is brighter than that of the most blushing Caucasian damsel. It is sometimes more distinctly orange than in any Mongolian, and in several species it is blue, passing into violet or gray. In all the species known to Mr. Bartlett, in which the adults of both sexes have strongly-colored faces, the colors are dull or absent during early youth. This likewise holds good with the Mandrill and Rhesus, in which the face and the posterior parts of the body are brilliantly colored in one sex alone. In these latter cases we have every reason to believe that the colors were acquired through sexual selection; and we are naturally led to extend the same view to the foregoing species, though both sexes when adult have their faces colored in the same manner.

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[44] I observed this fact in the Zoological Gardens; and numerous cases may be seen in the colored plates in Geoffroy St.-Hilaire and F. Cuvier, 'Hist. Nat. des Mammifères,' tom. i. 1824.

[45] Bates, 'The Naturalist on the Amazons,' 1863, vol. ii. p. 310.

Although, according to our taste, many kinds of monkeys are far from beautiful, other species are universally admired for their elegant appearance and bright colors. The *Semnopithecus nemæus*, though peculiarly colored, is described as extremely pretty; the orange-tinted face is surrounded by long whiskers of glossy whiteness, with a line of chestnut red over the eyebrows; the fur on the back is of a delicate gray, with a square patch on the loins, the tail and the forearms all of a pure white; a gorget of chestnut surmounts the chest; the hind-thighs are black, with the legs chestnut red. I will mention only two other monkeys on account of their beauty; and I have selected these as they present slight sexual differences in color, which renders it in some degree probable that both sexes owe their elegant appearance to sexual selection. In the mustache-monkey (*Cercopithecus cephus*), the general color of the fur is mottled greenish, with the throat white; in the male the end of the tail is chestnut; but the face is the most ornamented part, the skin being chiefly bluish-gray, shading into a blackish tint beneath the eyes, with the upper lip of a delicate blue, clothed on the lower edge with a thin black mustache; the whiskers are orange-colored, with the upper part black, forming a band which extends backward to the ears, the latter being clothed with whitish hairs. In the Zoological Society's Gardens I have often overheard visitors admiring the beauty of another monkey, deservedly called *Cercopithecus Diana* (Fig. 76); the general color of the fur is gray; the chest and inner surface of the fore-legs are white; a large triangular, defined space on the hinder part of the back is rich chestnut; in the male the inner sides of the thighs and the abdomen are delicate fawn-colored, and the top of the head is black;

the face and ears are intensely black, finely contrasted with a white transverse crest over the eyebrows and with

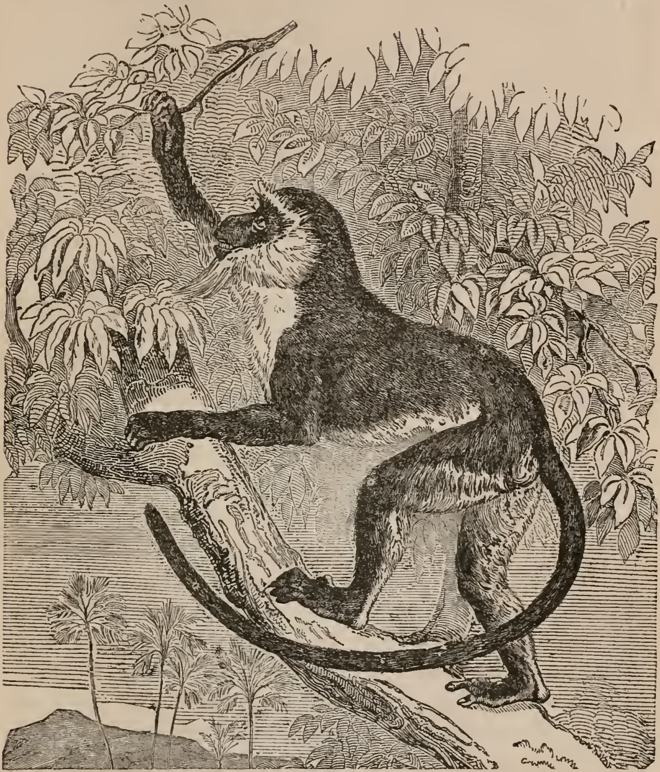

FIG. 76.—Cercopithecus Diana (from Brehm).

a long white peaked beard, of which the basal portion is black.[46]

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[46] I have seen most of the above-named monkeys in the Zoological Society's Gardens. The description of the *Semnopithecus nemæus* is taken from Mr. W. C. Martin's 'Nat. Hist. of Mammalia,' 1841, p. 460; see also pp. 475, 523.

In these and many other monkeys, the beauty and singular arrangement of their colors, and still more the diversified and elegant arrangement of the crests and tufts of hair on their heads, force the conviction on my mind that these characters have been acquired through sexual selection exclusively as ornaments.

Summary.—The law of battle for the possession of the female appears to prevail throughout the whole great class of mammals. Most naturalists will admit that the greater size, strength, courage, and pugnacity of the male, his special weapons of offence, as well as his special means of defence, have all been acquired or modified through that form of selection which I have called sexual selection. This does not depend on any superiority in the general struggle for life, but on certain individuals of one sex, generally the male sex, having been successful in conquering other males, and on their having left a larger number of offspring to inherit their superiority, than the less successful males.

There is another and more peaceful kind of contest, in which the males endeavor to excite or allure the females by various charms. This may be effected by the powerful odors emitted by the males during the breeding-season; the odoriferous glands having been acquired through sexual selection. Whether the same view can be extended to the voice is doubtful, for the vocal organs of the males may have been strengthened by use during maturity, under the powerful excitements of love, jealousy, or rage, and transmitted to the same sex. Various crests, tufts, and mantles of hair, which are either confined to the male, or are more developed in this sex than in the females, seem in most cases to be merely ornamental, though they sometimes serve as a defence against rival males. There is even reason to suspect that the branching horns of stags, and the elegant horns of certain antelopes, though properly serving as weapons of offence or of defence, have been partly modified for the sake of ornament.

When the male differs in color from the female, he generally exhibits darker and more strongly-contrasted tints. We do not in this class meet with the splendid red, blue, yellow, and green colors, so common with male birds and many other animals. The naked parts, however, of certain Quadrumana must be excepted; for such parts, often oddly situated, are colored in some species in the most brilliant manner. The colors of the male in other cases may be due to simple variation, without the aid of selection. But when the colors are diversified and strongly-pronounced, when they are not developed until near maturity, and when they are lost after emasculation, we can hardly avoid the conclusion that they have been acquired through sexual selection for the sake of ornament, and have been transmitted exclusively, or almost exclusively, to the same sex. When both sexes are colored in the same manner, and the colors are conspicuous or curiously arranged, without being of the least apparent use as a protection, and especially when they are associated with various other ornamental appendages, we are led by analogy to the same conclusion, namely, that they have been acquired through sexual selection, although transmitted to both sexes. That conspicuous and diversified colors, whether confined to the males or common to both sexes, are as a general rule associated in the same groups and subgroups with other secondary sexual characters, serving for war or for ornament, will be found to hold good if we look back to the various cases given in this and the last chapter.

The law of the equal transmission of characters to both sexes, as far as color and other ornaments are concerned, has prevailed far more extensively with mammals than with birds; but in regard to weapons, such as horns and tusks, these have often been transmitted either exclusively, or in a much higher degree, to the males than to the female. This is a surprising circumstance, for as the males generally use their weapons as a defence against enemies of all kinds, these weapons would have been of service to the females. Their absence in this sex can be accounted for, as far as we can see, only by the form of inheritance which has prevailed. Finally, with quadrupeds the contest between the individuals of the same sex, whether peaceful or bloody, has with the rarest exceptions been confined to the males; so that these have been modified through sexual selection, either for fighting with each other or for alluring the opposite sex, far more commonly than the females.

CHAPTER XIX.

SECONDARY SEXUAL CHARACTERS OF MAN.

Differences between Man and Woman.—Causes of such Differences and of Certain Characters common to both Sexes.—Law of Battle.—Differences in Mental Powers—and Voice.—On the Influence of Beauty in determining the Marriages of Mankind.—Attention paid by Savages to Ornaments.—Their Ideas of Beauty in Woman.—The Tendency to exaggerate each Natural Peculiarity.

WITH mankind the differences between the sexes are greater than in most species of Quadrumana, but not so great as in some, for instance, the mandrill. Man on an average is considerably taller, heavier, and stronger than woman, with squarer shoulders and more plainly-pronounced muscles. Owing to the relation which exists between muscular development and the projection of the brows,[1] the superciliary ridge is generally more strongly marked in man than in woman. His body, and especially his face, is more hairy, and his voice has a different and more powerful tone. In certain tribes the women are said, whether truly I know not, to differ slightly in tint from the men; and with Europeans, the women are perhaps the more brightly-colored of the two, as may be seen when both sexes have been equally exposed to the weather.

Man is more courageous, pugnacious, and energetic than woman, and has a more inventive genius. His brain is absolutely larger, but whether relatively to the larger size of his body, in comparison with that of woman, has not, I believe, been fully ascertained. In woman the face is rounder; the jaws and the base of the skull smaller; the outlines of her body rounder, in parts more prominent; and her pelvis is broader than in man;[2] but this latter character may perhaps be considered rather as a primary than a secondary sexual character. She comes to maturity at an earlier age than man.

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[1] Schaaffhausen, translation in 'Anthropological Review,' Oct. 1868, pp. 419, 420, 427.

As with animals of all classes, so with man, the distinctive characters of the male sex are not fully developed until he is nearly mature; and if emasculated they never appear. The beard, for instance, is a secondary sexual character, and male children are beardless, though at an early age they have abundant hair on their heads. It is probably due to the rather late appearance in life of the successive variations, by which man acquired his masculine characters, that they are transmitted to the male sex alone. Male and female children resemble each other closely, like the young of so many other animals in which the adult sexes differ; they likewise resemble the mature female much more closely than the mature male. The female, however, ultimately assumes certain distinctive characters, and in the formation of her skull is said to be intermediate between the child and the man.[3] Again, as the young of closely-allied though distinct species do not differ nearly so much from each other as do the adults, so it is with the children of the different races of man. Some have even maintained that race-differences cannot be detected in the infantile skull.[4] In regard to color, the new-born negro child is reddish nut-brown, which soon becomes slaty-gray; the black color being fully developed within a year in the Soudan, but not until three years in Egypt. The eyes of the negro are at first blue, and the hair chestnut-brown rather than black, being curled only at the ends. The children of the Australians immediately after birth are yellowish-brown, and become dark at a later age. Those of the Guaranys of Paraguay are whitish-yellow, but they acquire in the course of a few weeks the yellowish-brown tint of their parents. Similar observations have been made in other parts of America.[5]

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[2] Ecker, translation in 'Anthropological Review,' Oct. 1868, pp. 351–356. The comparison of the form of the skull, in men and women has been followed out with much care by Welcker.

[3] Ecker and Welcker, ibid. pp. 352, 355; Vogt, 'Lectures on Man. Eng. translat. p. 81.

[4] Schaaffhausen, 'Anthropolog. Review,' ibid. p. 429.

I have specified the foregoing familiar differences between the male and female sex in mankind, because they are curiously the same as in the Quadrumana. With these animals the female is mature at an earlier age than the male; at least this is certainly the case with the *Cebus azaræ*.[6] With most of the species the males are larger and much stronger than the females, of which fact the gorilla offers a well-known instance. Even in so trifling a character as the greater prominence of the superciliary ridge, the males of certain monkeys differ from the females,[7] and agree in this respect with mankind. In the gorilla and certain other monkeys, the cranium of the adult male presents a strongly-marked sagittal crest, which is absent in the female; and Ecker found a trace of a similar difference between the two sexes in the Australians. With monkeys, when there is any difference in the voice, that of the male is more powerful. We have seen that certain male monkeys have a well-developed beard, which is quite deficient, or much less developed, in the female. No instance is known of the beard, whiskers, or mustache being larger in a female than in the male monkey. Even in the color of the beard there is a curious parallelism between man and the Quadrumana, for when in man the beard differs in color from the hair of the head, as is often the case, it is, I believe, invariably of a lighter tint, being often reddish. I have observed this fact in England, and Dr. Hooker, who attended to this little point for me in Russia, found no exception to the rule. In Calcutta, Mr. J. Scott, of the Botanic Gardens, was so kind as to observe with care the many races of men to be seen there, as well as in some other parts of India, namely, two races in Sikhim, the Bhoteas, Hindoos, Burmese, and Chinese. Although most of these races have very little hair on the face, yet he always found that when there was any difference in color between the hair of the head and the beard, the latter was invariably of a lighter tint. Now with monkeys, as has already been stated, the beard frequently differs in a striking manner in color from the hair of the head, and in such cases it is invariably of a lighter hue, being often pure white, sometimes yellow or reddish.[9]

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[5] Pruner-Bey, on negro infants, as quoted by Vogt, 'Lectures on Man,' Eng. translat. 1864, p. 189: for further facts on negro infants, as quoted from Winterbottom and Camper, see Lawrence, 'Lectures on Physiology,' etc. 1822, p. 451. For the infants of the Guaranys, see Rengger, 'Säugethiere,' etc. s. 3. See also Godron, 'De l'Espèce,' tom. ii. 1859, p 253. For the Australians, Waitz, 'Introduct. to Anthropology,' Eng. translat. 1863, p. 99.

[6] Rengger, 'Säugethiere,' etc. 1830, s. 49.

[7] As in *Macacus cynomolgus* (Desmarest, 'Mammalogie,' p. 65) and in *Hylobates agilis* (Geoffroy St.-Hilaire and F. Cuvier, 'Hist Nat. des Mamm.' 1824, tom. i. p. 2).

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[8] 'Anthropological Review,' Oct. 1868, p. 353.

[9] Mr. Blyth informs me that he has never seen more than one instance of the beard, whiskers, etc., in a monkey becoming white with old age, as is so commonly the case with us. This, however, occurred in an aged and confined *Macacus cynomolgus*, whose mustaches were "remarkably long and human-like." Altogether this old monkey presented a ludicrous resemblance to one of the reigning monarchs of Europe, after whom he was universally nicknamed. In certain races of man the hair on the head hardly ever becomes gray; thus Mr. D. Forbes has never seen, as

In regard to the general hairiness of the body, the women in all races are less hairy than the men, and in some few Quadrumana the under side of the body of the female is less hairy than that of the male.[10] Lastly, male monkeys, like men, are bolder and fiercer than the females. They lead the troop, and when there is danger come to the front. We thus see how close is the parallelism between the sexual differences of man and the Quadrumana. With some few species, however, as with certain baboons, the gorilla, and orang, there is a considerably greater difference between the sexes, in the size of the canine teeth, in the development and color of the hair, and especially in the color of the naked parts of the skin, than in the case of mankind.

The secondary sexual characters of man are all highly variable, even within the limits of the same race or subspecies; and they differ much in the several races. These two rules generally hold good throughout the animal kingdom. In the excellent observations made on board the *Novara*,[11] the male Australians were found to exceed the females by only sixty-five millimetres in height, while with the Javanese the average excess was two hundred and eighteen millimetres, so that in this latter race the difference in height between the sexes is more than thrice as great as with the Australians. The numerous measurements of various other races, with respect to stature, the circumference of the neck and chest, and the length of the backbone and arms, which were carefully made, nearly all

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he informs me, an instance with the Aymaras and Quichuas of South America.

[10] This is the case with the females of several species of Hylobates, see Geoffroy St.-Hilaire and F. Cuvier, 'Hist. Nat. des Mamm.' tom. i. See, also, on *H. lar.* 'Penny Encyclopædia,' vol. ii. pp. 149, 150.

[11] The results were deduced by Dr. Weisbach from the measurements made by Drs. K. Scherzer and Schwarz, see 'Reise der *Novara:* Anthropolog Theil.' 1867, s. 216, 231, 234, 236, 239, 269.

showed that the males differed much more from each other than did the females. This fact indicates that, as far as these characters are concerned, it is the male which has been chiefly modified, since the races diverged from their common and primeval source.

The development of the beard and the hairiness of the body differ remarkably in the men belonging to distinct races, and even to different families in the same race. We Europeans see this among ourselves. In the island of St. Kilda, according to Martin,[12] the men do not acquire beards, which are very thin, until the age of thirty or upward. On the Europæo-Asiatic Continent, beards prevail until we pass beyond India, though with the natives of Ceylon they are frequently absent, as was noticed in ancient times by Diodorus.[13] Beyond India beards disappear, as with the Siamese, Malays, Calmucks, Chinese, and Japanese; nevertheless the Ainos,[14] who inhabit the northernmost islands of the Japan archipelago, are the most hairy men in the world. With negroes the beard is scanty or absent, and they have no whiskers; in both sexes the body is almost destitute of fine down.[15] On the other hand, the Papuans of the Malay archipelago, who are nearly as black as negroes, possess well-developed beards.[16] In the Pacific Ocean the inhabitants of the Fiji archipelago have large bushy beards, while those of the not-distant archipelagoes of Tonga and Samoa are beardless; but these men belong to distinct races. In the Ellice group all the inhabitants belong to the same race; yet on one island alone, namely, Nunemaya, "the men have splendid beards;" while on the other islands "they have, as a rule, a dozen straggling hairs for a beard."[17]

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[12] 'Voyage to St. Kilda' (3d edit. 1753), p. 37.

[13] Sir J. E. Tennent, 'Ceylon,' vol. ii. 1859, p. 107.

[14] Quatrefages, 'Revue des Cours Scientifiques,' Aug. 29, 1868, p. 630; Vogt, 'Lectures on Man,' Eng. translat. p. 127.

[15] On the beards of negroes, Vogt, 'Lectures,' etc. ibid. p. 127; Waitz, 'Introduct. to Anthropology,' Engl. translat. 1863, vol. i. p. 96. It is remarkable that in the United States ('Investigations in Military and Anthropological Statistics of American Soldiers,' 1869, p. 569) the pure negroes and their crossed offspring seem to have bodies almost as hairy as those of Europeans.

[16] Wallace, 'The Malay Arch.' vol. ii. 1869, p. 178.

Throughout the great American Continent the men may be said to be beardless; but in almost all the tribes a few short hairs are apt to appear on the face, especially during old age. With the tribes of North America, Catlin estimates that eighteen out of twenty men are completely destitute by nature of a beard; but occasionally there may be seen a man, who has neglected to pluck out the hairs at puberty, with a soft beard an inch or two in length. The Guaranys of Paraguay differ from all the surrounding tribes in having a small beard, and even some hair on the body, but no whiskers.[18] I am informed by Mr. D. Forbes, who particularly attended to this subject, that the Aymaras and Quichuas of the Cordillera are remarkably hairless, yet in old age a few straggling hairs occasionally appear on the chin. The men of these two tribes have very little hair on the various parts of the body where hair grows abundantly in Europeans, and the women have none on the corresponding parts. The hair on the head, however, attains an extraordinary length in both sexes, often reaching almost to the ground; and this is likewise the case with some of the North American tribes. In the amount of hair, and in the general shape of the body, the sexes of the American aborigines do not differ from each other so much as with most other races of mankind.[19] This fact is analogous with what occurs with some allied monkeys; thus the sexes of the chimpanzee are not as different as those of the gorilla or orang.[20]

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[17] Dr. J. Barnard Davis on Oceanic Races, in 'Anthropolog. Review,' April, 1870, pp. 185, 191.

[18] Catlin, 'North American Indians,' 3d edit. 1842, vol. ii. p. 227. On the Guaranys, see Azara, 'Voyages dans l'Amérique Mérid.' tom. ii. 1809, p. 58; also Rengger, 'Säugethiere von Paraguay,' s. 3.

[19] Prof. and Mrs. Agassiz ('Journey in Brazil,' p. 530) remark that

In the previous chapters we have seen that with mammals, birds, fishes, insects, etc., many characters, which there is every reason to believe were primarily gained through sexual selection by one sex alone, have been transferred to both sexes. As this same form of transmission has apparently prevailed to a large extent with mankind, it will save much useless repetition if we consider the characters peculiar to the male sex together with certain other characters common to both sexes.

Law of Battle.—With barbarous nations, for instance with the Australians, the women are the constant cause of war both between the individuals of the same tribe and between distinct tribes. So no doubt it was in ancient times; "nam fuit ante Helenam mulier teterrima belli causa." With the North American Indians, the contest is reduced to a system. That excellent observer, Hearne,[21] says: "It has ever been the custom among these people for the men to wrestle for any woman to whom they are attached; and, of course, the strongest party always carries off the prize. A weak man, unless he be a good hunter, and well-beloved, is seldom permitted to keep a wife that a stronger man thinks worth his notice. This custom prevails throughout all the tribes, and causes a great spirit of emulation among their youth, who are upon all oc-

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the sexes of the American Indians differ less than those of the negroes and of the higher races. See also Rengger, ibid. p. 3, on the Guaranys.

[20] Rütimeyer, 'Die Grenzen der Thierwelt; eine Betrachtung zu Darwin's Lehre,' 1868, s. 54.

[21] 'A Journey from Prince of Wales Fort,' 8vo edit. Dublin, 1796, p. 104. Sir J. Lubbock ('Origin of Civilization,' 1870, p. 69) gives other and similar cases in North America. For the Guanas of South America see Azara, 'Voyages,' etc., tom. ii. p. 94.

casions, from their childhood, trying their strength and skill in wrestling." With the Guanas of South America, Azara states that the men rarely marry till twenty or more years old, as before that age they cannot conquer their rivals.

Other similar facts could be given; but even if we had no evidence on this head, we might feel almost sure, from the analogy of the higher Quadrumana,[22] that the law of battle had prevailed with man during the early stages of his development. The occasional appearance at the present day of canine teeth which project above the others, with traces of a diastema or open space for the reception of the opposite canines, is in all probability a case of reversion to a former state, when the progenitors of man were provided with these weapons, like so many existing male Quadrumana. It was remarked in a former chapter that as man gradually became erect, and continually used his hands and arms for fighting with sticks and stones, as well as for the other purposes of life, he would have used his jaws and teeth less and less. The jaws, together with their muscles, would then have become reduced through disuse, as would the teeth, through the not well understood principles of correlation and the economy of growth; for we everywhere see that parts which are no longer of service are reduced in size. By such steps the original inequality between the jaws and teeth in the two sexes of mankind would ultimately have been quite obliterated. The case is almost parallel with that of many male Ruminants, in which the canine teeth have been reduced to mere rudiments, or have disappeared, apparently in consequence of the development of horns. As the prodigious difference between the skulls of the two sexes in the Gorilla and

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[22] On the fighting of the male gorilla, see Dr. Savage, in 'Boston Journal of Nat. His.' vol. v. 1847, p. 423. On *Presbytis entellus*, see the 'Indian Field,' 1859, p. 146.

Orang stands in close relation with the development of the immense canine teeth in the males, we may infer that the reduction of the jaws and teeth in the early male progenitors of man led to a most striking and favorable change in his appearance.

There can be little doubt that the greater size and strength of man, in comparison with woman, together with his broader shoulders, more developed muscles, rugged outline of body, his greater courage and pugnacity, are all due in chief part to inheritance from some early male progenitor, who, like the existing anthropoid apes, was thus characterized. These characters will, however have been preserved or even augmented during the long ages while man was still in a barbarous condition, by the strongest and boldest men having succeeded best in the general struggle for life, as well as in securing wives, and thus having left a large number of offspring. It is not probable that the greater strength of man was primarily acquired through the inherited effects of his having worked harder than woman for his own subsistence and that of his family; for the women in all barbarous nations are compelled to work at least as hard as the men. With civilized people the arbitrament of battle for the possession of the women has long ceased; on the other hand, the men, as a general rule, have to work harder than the women for their mutual subsistence; and thus their greater strength will have been kept up.

Difference in the Mental Powers of the two Sexes.—With respect to differences of this nature between man and woman, it is probable that sexual selection has played a very important part. I am aware that some writers doubt whether there is any inherent difference; but this is at least probable from the analogy of the lower animals which present other secondary sexual characters. No one will dispute that the bull differs in disposition from the cow, the wild-boar from the sow, the stallion from the mare, and, as is well known to the keepers of menageries, the males of the larger apes from the females. Woman seems to differ from man in mental disposition, chiefly in her greater tenderness and less selfishness; and this holds good even with savages, as shown by a well-known passage in Mungo Park's Travels, and by statements made by many other travellers. Woman, owing to her maternal instincts, displays these qualities toward her infants in an eminent degree; therefore it is likely that she should often extend them toward her fellow-creatures. Man is the rival of other men; he delights in competition, and this leads to ambition which passes too easily into selfishness. These latter qualities seem to be his natural and unfortunate birthright. It is generally admitted that with woman the powers of intuition, of rapid perception, and perhaps of imitation, are more strongly marked than in man; but some, at least, of these faculties are characteristic of the lower races, and therefore of a past and lower state of civilization.

The chief distinction in the intellectual powers of the two sexes is shown by man attaining to a higher eminence, in whatever he takes up, than woman can attain—whether requiring deep thought, reason, or imagination, or merely the use of the senses and hands. If two lists were made of the most eminent men and women in poetry, painting, sculpture, music—comprising composition and performance, history, science, and philosophy, with half a dozen names under each subject, the two lists would not bear comparison. We may also infer, from the law of the deviation of averages, so well illustrated by Mr. Galton, in his work on "Hereditary Genius," that if men are capable of decided eminence over women in many subjects, the average standard of mental power in man must be above that of woman.

The half-human male progenitors of man, and men in a savage state, have struggled together during many generations for the possession of the females. But mere bodily strength and size would do little for victory, unless associated with courage, perseverance, and determined energy. With social animals, the young males have to pass through many a contest before they win a female, and the older males have to retain their females by renewed battles. They have, also, in the case of man, to defend their females as well as their young from enemies of all kinds, and to hunt for their joint subsistence. But to avoid enemies, or to attack them with success, to capture wild animals, and to invent and fashion weapons, requires the aid of the higher mental faculties, namely, observation, reason, invention, or imagination. These various faculties will thus have been continually put to the test, and selected during manhood; they will, moreover, have been strengthened by use during this same period of life. Consequently, in accordance with the principle often alluded to, we might expect that they would at least tend to be transmitted chiefly to the male offspring at the corresponding period of manhood.

Now, when two men are put into competition, or a man with a woman, who possess every mental quality in the same perfection, with the exception that the one has higher energy, perseverance, and courage, this one will generally become more eminent, whatever the object may be, and will gain the victory.[23] He may be said to possess genius—for genius has been declared by a great authority to be patience; and patience, in this sense, means unflinching, undaunted perseverance. But this view of genius is perhaps deficient; for without the higher powers of the imagination and reason, no eminent success in many subjects can be gained. But these latter as well as the former faculties will have been developed in man, partly through sexual selection—that is, through the contest of rival males, and partly through natural selection—that is, from success in the general struggle for life; and as in both cases the struggle will have been during maturity, the characters thus gained will have been transmitted more fully to the male than to the female offspring. Thus man has ultimately become superior to woman. It is, indeed, fortunate that the law of the equal transmission of characters to both sexes has commonly prevailed throughout the whole class of mammals; otherwise it is probable that man would have become as superior in mental endowment to woman, as the peacock is in ornamental plumage to the peahen.

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[23] J. Stuart Mill remarks ('The Subjection of Women,' 1869, p. 122), "The things in which man most excels woman are those which require most plodding, and long hammering at single thoughts." What is this but energy and perseverance?

It must be borne in mind that the tendency in characters acquired at a late period of life by either sex, to be transmitted to the same sex at the same age, and of characters acquired at an early age to be transmitted to both sexes, are rules which, though general, do not always hold good. If they always held good, we might conclude (but I am here wandering beyond my proper bounds) that the inherited effects of the early education of boys and girls would be transmitted equally to both sexes; so that the present inequality between the sexes in mental power could not be effaced by a similar course of early training; nor can it have been caused by their dissimilar early training. In order that woman should reach the same standard as man, she ought, when nearly adult, to be trained to energy and perseverance, and to have her reason and imagination exercised to the highest point; and then she would probably transmit these qualities chiefly to her adult daughters. The whole body of women, however, could not be thus raised, unless during many generations the women who excelled in the above robust virtues were married, and produced offspring in larger numbers than other women. As before remarked with respect to bodily strength, although men do not now fight for the sake of obtaining wives, and this form of selection has passed away, yet they generally have to undergo, during manhood, a severe struggle in order to maintain themselves and their families; and this will tend to keep up or even increase their mental powers, and, as a consequence, the present inequality between the sexes.[24]

Voice and Musical Powers.—In some species of Quadrumana there is a great difference between the adult sexes, in the power of the voice and in the development of the vocal organs; and man appears to have inherited this difference from his early progenitors. His vocal cords are about one-third longer than in woman, or than in boys; and emasculation produces the same effect on him as on the lower animals, for it "arrests that prominent growth of the thyroid, etc., which accompanies the elongation of the cords."[25] With respect to the cause of this difference between the sexes, I have nothing to add to the remarks made in the last chapter on the probable effects of the long-continued use of the vocal organs by the male under the excitement of love, rage, and jealousy. According to Sir Duncan Gibb,[26] the voice differs in the different races of mankind; and with the natives of Tartary, China, etc., the voice of the male is said not to differ so much from that of the female, as in most other races.

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[24] An observation by Vogt bears on this subject: he says, it is a "remarkable circumstance, that the difference between the sexes, as regards the cranial cavity, increases with the development of the race, so that the male European excels much more the female, than the negro the negress. Welcker confirms this statement of Huschke from his measurements of negro and German skulls." But Vogt admits ('Lectures on Man,' Eng translat. 1864, p. 81) that more observations are requisite on this point.

[25] Owen, 'Anatomy of Vertebrates,' vol. iii. p. 603.

The capacity and love for singing or music, though not a sexual character in man, must not here be passed over. Although the sounds emitted by animals of all kinds serve many purposes, a strong case can be made out, that the vocal organs were primarily used and perfected in relation to the propagation of the species. Insects and some few spiders are the lowest animals which voluntarily produce any sound; and this is generally effected by the aid of beautifully-constructed stridulating organs, which are often confined to the males alone. The sounds thus produced consist, I believe in all cases, of the same note, repeated rhythmically;[27] and this is sometimes pleasing even to the ears of man. Their chief, and in some cases exclusive use appears to be either to call or to charm the opposite sex.

The sounds produced by fishes are said in some cases to be made only by the males during the breeding-season. All the air-breathing Vertebrata necessarily possess an apparatus for inhaling and expelling air, with a pipe capable of being closed at one end. Hence when the primeval members of this class were strongly excited and their muscles violently contracted, purposeless sounds would almost certainly have been produced; and these, if they proved in any way serviceable, might readily have been modified or intensified by the preservation of properly-adapted variations. The Amphibians are the lowest Vertebrates which breathe air; and many of these animals, namely, frogs and toads, possess vocal organs, which are incessantly used during the breeding-season, and which are often more highly developed in the male than in the female. The male alone of the tortoise utters a noise, and this only during the season of love. Male alligators roar or bellow during the same season. Every one knows how largely birds use their vocal organs as a means of courtship; and some species likewise perform what may be called instrumental music.

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[26] 'Journal of the Anthropolog. Soc.' April, 1869, pp. lvii., lxvi.

[27] Dr. Scudder, "Notes on Stridulation," in 'Proc. Boston Soc. of Nat. Hist.' vol. xi. April, 1868.

In the class of Mammals, with which we are here more particularly concerned, the males of almost all the species use their voices during the breeding-season much more than at any other time; and some are absolutely mute excepting at this season. Both sexes of other species, or the females alone, use their voices as a love-call. Considering these facts, and that the vocal organs of some quadrupeds are much more largely developed in the male than in the female, either permanently or temporarily during the breeding season; and considering that in most of the lower classes the sounds produced by the males, serve not only to call but to excite or allure the female, it is a surprising fact that we have not as yet any good evidence that these organs are used by male mammals to charm the females. The American *Mycetes caraya* perhaps forms an exception, as does more probably one of those apes which come nearer to man, namely, the *Hylobates agilis*. This gibbon has an extremely loud but musical voice. Mr. Waterhouse states,[28] "It appeared to me that in ascending and descending the scale, the intervals were always exactly half-tones; and I am sure that the highest note was the exact octave to the lowest. The quality of the notes is very musical; and I do not doubt that a good violinist would be able to give a correct idea of the gibbon's composition, excepting as regards its loudness." Mr. Waterhouse then gives the notes. Prof. Owen, who is likewise a musician, confirms the foregoing statement, and remarks that this gibbon "alone of brute mammals may be said to sing." It appears to be much excited after its performance. Unfortunately, its habits have never been closely observed in a state of nature; but from the analogy of almost all other animals, it is highly probable that it utters its musical notes especially during the season of courtship.

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[28] Given in W. C. L. Martin's 'General Introduct. to Nat. Hist. of Mamm. Animals,' 1841, p. 432; Owen, 'Anatomy of Vertebrates,' vol. iii. p. 600.

The perception, if not the enjoyment, of musical cadences and of rhythm is probably common to all animals, and no doubt depends on the common physiological nature of their nervous systems. Even Crustaceans, which are not capable of producing any voluntary sound, possess certain auditory hairs, which have been seen to vibrate when the proper musical notes are struck.[29] It is well known that some dogs howl when hearing particular tones. Seals apparently appreciate music, and their fondness for it "was well known to the ancients, and is often taken advantage of by the hunters at the present day."[30] With all those animals, namely insects, amphibians, and birds, the males of which during the season of courtship incessantly produce musical notes or mere rhythmical sounds, we must believe that the females are able to appreciate them, and are thus excited or charmed; otherwise the incessant efforts of the males and the complex structures often possessed exclusively by them would be useless.

With man song is generally admitted to be the basis or origin of instrumental music. As neither the enjoyment nor the capacity of producing musical notes are faculties of the least direct use to man in reference to his ordinary habits of life, they must be ranked among the most mysterious with which he is endowed. They are present, though in a very rude and as it appears almost latent condition, in men of all races, even the most savage; but so different is the taste of the different races, that our music gives not the least pleasure to savages, and their music is to us hideous and unmeaning. Dr. Seeman, in some interesting remarks on this subject,[31] "doubts whether even among the nations of Western Europe, intimately connected as they are by close and frequent intercourse, the music of the one is interpreted in the same sense by the others. By travelling eastward we find that there is certainly a different language of music. Songs of joy and dance-accompaniments are no longer, as with us, in the major keys, but always in the minor." Whether or not the half-human progenitors of man possessed, like the before-mentioned gibbon, the capacity of producing, and no doubt of appreciating, musical notes, we have every reason to believe that man possessed these faculties at a very remote period, for singing and music are extremely ancient arts. Poetry, which may be considered as the offspring of song, is likewise so ancient that many persons have felt astonishment that it should have arisen during the earliest ages of which we have any record.

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[29] Helmholtz, 'Théorie Phys. de la Musique,' 1868, p. 187.

[30] Mr. R. Brown, in 'Proc. Zool. Soc.' 1868, p. 410.

The musical faculties, which are not wholly deficient in any race, are capable of prompt and high development, as we see with Hottentots and Negroes, who have readily become excellent musicians, although they do not practise in their native countries any thing that we should esteem as music. But there is nothing anomalous in this circumstance: some species of birds which never naturally sing, can without much difficulty be taught to perform; thus the house-sparrow has learned the song of a linnet. As these two species are closely allied, and belong to the order of Insessores, which includes nearly all the singing-birds in the world, it is quite possible or probable that a progenitor of the sparrow may have been a songster. It is a much more remarkable fact that parrots, which belong to a group distinct from the Insessores, and have differently-constructed vocal organs, can be taught not only to speak, but to pipe or whistle tunes invented by man, so that they must have some musical capacity. Nevertheless it would be extremely rash to assume that parrots are descended from some ancient progenitor which was a songster. Many analogous cases could be advanced of organs and instincts originally adapted for one purpose, having been utilized for some quite distinct purpose.[32] Hence the capacity for high musical development, which the savage races of man possess, may be due either to our semi-human progenitors having practised some rude form of music, or simply to their having acquired for some distinct purposes the proper vocal organs. But in this latter case we must assume that they already possessed, as in the above instance of the parrots, and as seems to occur with many animals, some sense of melody.

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[31] 'Journal of Anthropolog. Soc.' Oct. 1870, p. clv. See also the several later chapters in Sir John Lubbock's 'Prehistoric Times,' second edition, 1869, which contains an admirable account of the habits of savages.

Music affects every emotion, but does not by itself excite in us the more terrible emotions of horror, rage, etc. It awakens the gentler feelings of tenderness and love, which readily pass into devotion. It likewise stirs up in us the sensation of triumph and the glorious ardor for war. These powerful and mingled feelings may well give rise to the sense of sublimity. We can concentrate, as Dr. Seemann observes, greater intensity of feeling in a single musical note than in pages of writing. Nearly the same emotions, but much weaker and less complex, are probably felt by birds when the male pours forth his full volume of song, in rivalry with other males, for the sake of captivating the female. Love is still the commonest theme of our own songs. As Herbert Spencer remarks, music "arouses dormant sentiments of which we had not conceived the possibility, and do not know the meaning; or, as Richter says, tell us of things we have not seen and shall not see."[33] Conversely, when vivid emotions are felt and expressed by the orator or even in common speech, musical cadences and rhythm are instinctively used. Monkeys also express strong feelings in different tones—anger and impatience by low—fear and pain by high notes.[34] The sensations and ideas excited in us by music, or by the cadences of impassioned oratory, appear from their vagueness, yet depth, like mental reversions to the emotions and thoughts of a long-past age.

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[32] Since this chapter has been printed I have seen a valuable article by Mr. Chauncey Wright ('North Amer. Review,' Oct. 1870, p. 293), who, in discussing the above subject, remarks: "There are many consequences of the ultimate laws or uniformities of Nature through which the acquisition of one useful power will bring with it many resulting advantages as well as limiting disadvantages, actual or possible, which the principle of utility may not have comprehended in its action." This principle has an important bearing, as I have attempted to show in the second chapter of this work, on the acquisition by man of some of his mental characteristics.

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[33] See the very interesting discussion on the Origin and Function of Music, by Mr. Herbert Spencer, in his collected 'Essays,' 1858, p 359. Mr. Spencer comes to an exactly opposite conclusion to that at which I have arrived. He concludes that the cadences used in emotional speech afford the foundation from which music has been developed; while I conclude that musical notes and rhythm were first acquired by the male or female progenitors of mankind for the sake of charming the opposite sex. Thus musical tones became firmly associated with some of the strongest passions an animal is capable of feeling, and are consequently used instinctively, or through association, when strong emotions are expressed in speech. Mr. Spencer does not offer any satisfactory explanation, nor can I, why high or deep notes should be expressive, both with man and the lower animals, of certain emotions. Mr. Spencer gives also an interesting discussion on the relations between poetry, recitative, and song.

[34] Rengger, 'Säugethiere von Paraguay,' s. 49.

All these facts with respect to music become to a certain extent intelligible if we may assume that musical tones and rhythm were used by the half-human progenitors of man, during the season of courtship, when animals of all kinds are excited by the strongest passions. In this case, from the deeply-laid principle of inherited associations, musical tones would be likely to excite in us, in a vague and indefinite manner, the strong emotions of a long-past age. Bearing in mind that the males of some quadrumanous animals have their vocal organs much more developed than in the females, and that one anthropomorphous species pours forth a whole octave of musical notes and may be said to sing, the suspicion does not appear improbable that the progenitors of man, either the males or females, or both sexes, before they had acquired the power of expressing their mutual love in articulate language, endeavored to charm each other with musical notes and rhythm. So little is known about the use of the voice by the Quadrumana during the season of love, that we have hardly any means of judging whether the habit of singing was first acquired by the male or female progenitors of mankind. Women are generally thought to possess sweeter voices than men, and as far as this serves as any guide we may infer that they first acquired musical powers in order to attract the other sex.[35] But if so, this must have occurred long ago, before the progenitors of man had become sufficiently human to treat and value their women merely as useful slaves. The impassioned orator, bard, or musician, when with his varied tones and cadences he excites the strongest emotions in his hearers, little suspects that he uses the same means by which, at an extremely remote period, his half-human ancestors aroused each other's ardent passions, during their mutual courtship and rivalry.

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[35] See an interesting discussion on this subject by Häckel, 'Generelle Morph.' B. ii. 1866, s. 246.

On the Influence of Beauty in determining the Marriages of Mankind.—In civilized life man is largely, but by no means exclusively, influenced in the choice of his wife by external appearance; but we are chiefly concerned with primeval times, and our only means of forming a judgment on this subject is to study the habits of existing semi-civilized and savage nations. If it can be shown that the men of different races prefer women having certain characteristics, or conversely that the women prefer certain men, we have then to inquire whether such choice, continued during many generations, would produce any sensible effect on the race, either on one sex on both sexes; this latter circumstance depending on the form of inheritance which prevails.

It will be well first to show in some detail that savages pay the greatest attention to their personal appearance.[36] That they have a passion for ornament is notorious; and an English philosopher goes so far as to maintain that clothes were first made for ornament and not for warmth. As Prof. Waitz remarks, "however poor and miserable man is, he finds a pleasure in adorning himself."

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[36] A full and excellent account of the manner in which savages in all parts of the world ornament themselves is given by the Italian traveller, Prof. Mantegazza, 'Rio de la Plata, Viaggi e Studi,' 1867, pp. 525–545; all the following statements, when other references are not given, are taken from this work. See, also, Waitz, 'Introduct. to Anthropolog.' Eng. transl. vol. i. 1863, p. 275, *et passim*. Lawrence also gives very full details in his 'Lectures on Physiology,' 1822. Since this chapter was written, Sir J. Lubbock has published his 'Origin of Civilization,' 1870, in which there is an interesting chapter on the present subject, and from which (pp. 42, 48) I have taken some facts about savages dyeing their teeth and hair, and piercing their teeth.

The extravagance of the naked Indians of South America in decorating themselves is shown "by a man of large stature gaining with difficulty enough by the labor of a fortnight to procure in exchange the *chica* necessary to paint himself red."[37] The ancient barbarians of Europe during the Reindeer period brought to their caves any brilliant or singular objects which they happened to find. Savages at the present day everywhere deck themselves with plumes, necklaces, armlets, ear-rings, etc. They paint themselves in the most diversified manner. "If painted nations," as Humboldt observes, "had been examined with the same attention as clothed nations, it would have been perceived that the most fertile imagination and the most mutable caprice have created the fashions of painting, as well as those of garments."

In one part of Africa the eyelids are colored black; in another the nails are colored yellow or purple. In many places the hair is dyed of various tints. In different countries the teeth are stained black, red, blue, etc., and in the Malay archipelago it is thought shameful to have white teeth like those of a dog. Not one great country can be named, from the Polar regions in the north to New Zealand in the south, in which the aborigines do not tattoo themselves. This practice was followed by the Jews of old and by the ancient Britons. In Africa some of the natives tattoo themselves, but it is much more common to raise protuberances by rubbing salt into incisions made in various parts of the body; and these are considered by the inhabitants of Kordofan and Darfur "to be great personal attractions." In the Arab countries no beauty can be perfect until the cheeks "or temples have been gashed."[38]

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[37] Humboldt, 'Personal Narrative,' Eng. translat. vol. iv. p. 515; on the imagination shown in painting the body, p. 522; on modifying the form of the calf of the leg, p. 466.

[38] 'The Nile Tributaries,' 1867; 'The Albert N'yanza,' 1866, vol i. p. 218.

In South America, as Humboldt remarks, "a mother would be accused of culpable indifference toward her children, if she did not employ artificial means to shape the calf of the leg after the fashion of the country." In the Old and New World the shape of the skull was formerly modified during infancy in the most extraordinary manner, as is still the case in many places, and such deformities are considered ornamental. For instance, the savages of Colombia[39] deem a much flattened head an "essential point of beauty."

The hair is treated with especial care in various countries; it is allowed to grow to full length, so as to reach the ground, or is combed into "a compact frizzled mop, which is the Papuan's pride and glory."[40] In Northern Africa "a man requires a period of from eight to ten years to perfect his coiffure." With other nations the head is shaved, and in parts of South America and Africa even the eyebrows are eradicated. The natives of the Upper Nile knock out the four front teeth, saying that they do not wish to resemble brutes. Further south, the Batokas knock out the two upper incisors, which, as Livingstone[41] remarks, gives the face a hideous appearance, owing to the growth of the lower jaw; but these people think the presence of the incisors most unsightly, and on beholding some Europeans, cried out, "Look at the great teeth!" The great chief Sebituani tried in vain to alter this fashion. In various parts of Africa and in the Malay Archipelago the natives file the incisor teeth into points like those of a saw, or pierce them with holes, into which they insert studs.

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[39] Quoted by Prichard, 'Phys. Hist. of Mankind.' 4th edit. vol. i. 1851, p. 321.

[40] On the Papuans, Wallace, 'The Malay Archipelago,' vol. ii. p. 445. On the coiffure of the Africans, Sir S. Baker, 'The Albert N'yanza,' vol i. p. 210.

[41] 'Travels,' p. 533.

As the face with us is chiefly admired for its beauty, so with savages it is the chief seat of mutilation. In all quarters of the world, the septum, and more rarely the wings of the nose are pierced, with rings, sticks, feathers, and other ornaments, inserted into the holes. The ears are everywhere pierced and similarly ornamented, and with the Botocudos and Lenguas of South America the hole is gradually so much enlarged that the lower edge touches the shoulder. In North and South America and in Africa either the upper or lower lip is pierced; and with the Botocudos the hole in the lower lip is so large that a disk of wood four inches in diameter is placed in it. Mantegazza gives a curious account of the shame felt by a South American native, and of the ridicule which he excited, when he sold his *tembeta*—the large colored piece of wood which is passed through the hole. In Central Africa the women perforate the lower lip and wear a crystal, which, from the movement of the tongue, has "a wriggling motion indescribably ludicrous during conversation." The "wife of the chief of Latooka told Sir S. Baker[42] that his wife would be much improved if she would extract her four front teeth from the lower jaw, and wear the long pointed polished crystal in her under lip." Farther south with the Makalolo, the upper lip is perforated, and a large metal and bamboo ring, called a *pelelé*, is worn in the hole. "This caused the lip in one case to project two inches beyond the tip of the nose; and when the lady smiled the contraction of the muscles elevated it over the eyes. 'Why do women wear these things?' the venerable chief, Chinsurdi, was asked. Evidently surprised at such a stupid question, he replied, 'For beauty! They are the only beautiful things women have; men have beards, women have none. What kind of a person would she be without the pelelé? She would not be a woman at all with a mouth like a man, but no beard.'"[43]

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[42] 'The Albert N'yanza,' 1866, vol. i. p. 217.

Hardly any part of the body, which can be unnaturally modified, has escaped. The amount of suffering thus caused must have been wonderfully great, for many of the operations require several years for their completion, so that the idea of their necessity must be imperative. The motives are various; the men paint their bodies to make themselves appear terrible in battle; certain mutilations are connected with religious rites; or they mark the age of puberty, or the rank of the man, or they serve to distinguish the tribes. As with savages the same fashions prevail for long periods,[44] mutilations, from whatever cause first made, soon come to be valued as distinctive marks. But self-adornment, vanity, and the admiration of others, seem to be the commonest motives. In regard to tattooing, I was told by the missionaries in New Zealand, that when they tried to persuade some girls to give up the practice, they answered, "We must just have a few lines on our lips; else when we grow old we shall be so very ugly." With the men of New Zealand, a most capable judge[45] says, "To have fine tattooed faces was the great ambition of the young, both to render themselves attractive to the ladies, and conspicuous in war." A star tattooed on the forehead and a spot on the chin are thought by the women in one part of Africa to be irresistible attractions.[46] In most, but not all parts of the world, the men are more highly ornamented than the women, and often in a different manner; sometimes, though rarely, the women are hardly at all ornamented. As the women are made by savages to perform the greatest share of the work, and as they are not allowed to eat the best kinds of food, so it accords with the characteristic selfishness of man that they should not be allowed to obtain, or to use, the finest ornaments. Lastly, it is a remarkable fact, as proved by the foregoing quotations, that the same fashions in modifying the shape of the head, in ornamenting the hair, in painting, tattooing, perforating the nose, lips, or ears, in removing or filing the teeth, etc., now prevail and have long prevailed in the most distant quarters of the world. It is extremely improbable that these practices which are followed by so many distinct nations are due to tradition from any common source. They rather indicate the close similarity of the mind of man, to whatever race he may belong, in the same manner as the almost universal habits of dancing, masquerading, and making rude pictures.

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[43] Livingstone, 'British Association,' 1860; report given in the 'Athenæum,' July 7, 1860, p. 29.

[44] Sir S. Baker (ibid. vol. i. p. 210), speaking of the natives of Central Africa, says, "Every tribe has a distinct and unchanging fashion for dressing the hair." See Agassiz ('Journey in Brazil,' 1868, p. 318) on the invariability of the tattooing of the Amazonian Indians.

[45] Rev. R. Taylor, 'New Zealand and its Inhabitants,' 1855, p. 152.

[46] Mantegazza, 'Viaggi e Studi,' p. 542.

Having made these preliminary remarks on the admiration felt by savages for various ornaments, and for deformities most unsightly in our eyes, let us see how far the men are attracted by the appearance of their women, and what are their ideas of beauty. As I have heard it maintained that savages are quite indifferent about the beauty of their women, valuing them solely as slaves, it may be well to observe that this conclusion does not at all agree with the care which the women take in ornamenting them selves, or with their vanity. Burchell[47] gives an amusing account of a Bushwoman, who used so much grease, red ochre, and shining-powder, "as would have ruined any but a very rich husband." She displayed also "much vanity and too evident a consciousness of her superiority.

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[47] 'Travels in South Africa,' 1824, vol. i. p. 414.

Mr. Winwood Reade informs me that the negroes of the West Coast often discuss the beauty of their women. Some competent observers have attributed the fearfully common practice of infanticide partly to the desire felt by the women to retain their good looks.[48] In several regions the women wear charms and love-philters to gain the affections of the men; and Mr. Brown enumerates four plants used for this purpose by the women of Northwestern America.[49]

Hearne,[50] who lived many years with the American Indians, and who was an excellent observer, says, in speaking of the women, "Ask a northern Indian what is beauty, and he will answer, a broad flat face, small eyes, high cheek-bones, three or four broad black lines across each cheek, a low forehead, a large broad chin, a clumsy hook nose, a tawny hide, and breasts hanging down to the belt." Pallas, who visited the northern parts of the Chinese empire, says, "Those women are preferred who have the Mandschú form; that is to say, a broad face, high cheek-bones, very broad noses, and enormous ears;"[51] and Vogt remarks that the obliquity of the eye, which is proper to the Chinese and Japanese, is exaggerated in their pictures for the purpose, as "it seems, of exhibiting its beauty, as contrasted with the eye of the red-haired barbarians." It is well known, as Huc repeatedly remarks, that the Chinese of the interior think Europeans hideous with their white skins and prominent noses. The nose is far from being too prominent, according to our ideas, in the natives of Ceylon; yet "the Chinese in the seventh century, accustomed to the flat features of the Mogul races, were surprised at the prominent noses of the Cingalese; and Thsang described them as having 'the beak of a bird, with the body of a man.'"

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[48] See, for references, 'Gerland über das Aussterben der Naturvölker,' 1868, s. 51, 53, 55; also Azara, 'Voyages,' etc., tom. ii. p. 116.

[49] On the vegetable productions used by the Northwestern American Indians, 'Pharmaceutical Journal,' vol. x.

[50] 'A Journey from Prince of Wales Fort,' 8vo edit. 1796, p. 89.

[51] Quoted by Prichard, 'Phys. Hist. of Mankind,' 3d edit. vol. iv, 1844, p. 519; Vogt, 'Lectures on Man,' Eng. translat. p. 129. On the opinion of the Chinese on the Cingalese, E. Tennent, 'Ceylon,' vol. ii. 1859, p. 107.

Finlayson, after minutely describing the people of Cochin-China, says that their rounded heads and faces are their chief characteristics; and he adds, "The roundness of the whole countenance is more striking in the women, who are reckoned beautiful in proportion as they display this form of face." The Siamese have small noses with divergent nostrils, a wide mouth, rather thick lips, a remarkably large face, with very high and broad cheek-bones. It is, therefore, not wonderful that "beauty, according to our notion, is a stranger to them. Yet they consider their own females to be much more beautiful than those of Europe."[52]

It is well known that with many Hottentot women the posterior part of the body projects in a wonderful manner; they are steatopygous; and Sir Andrew Smith is certain that this peculiarity is greatly admired by the men.[53] He once saw a woman who was considered a beauty, and she was so immensely developed behind, that when seated on level ground she could not rise, and had to push herself along until she came to a slope. Some of the women in various negro tribes are similarly characterized; and, according to Burton, the Somal men "are said to choose their wives by ranging them in a line, and by picking her out who projects farthest *a tergo*. Nothing can be more hateful to a negro than the opposite form."[54]

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[52] Prichard, as taken from Crawfurd and Finlayson, 'Phys. Hist. of Mankind,' vol. iv. pp. 534, 535.

[53] "Idem illustrissimus viator dixit mihi præcinctorium vel tabula fœminæ, quod nobis teterrimum est, quondam permagno æstimari ab hominibus in hac gente. Nunc res mutata est, et censet talem conformationem minime optandam est."

With respect to color, the negroes rallied Mungo Park on the whiteness of his skin and the prominence of his nose, both of which they considered as "unsightly and unnatural conformations." He in return praised the glossy jet of their skins and the lovely depression of their noses; this they said was "honey-mouth," nevertheless they gave him food. The African Moors, also, "knitted their brows and seemed to shudder" at the whiteness of his skin. On the eastern coast, the negro boys, when they saw Burton, cried out, "Look at the white man! does he not look like a white ape?" On the western coast, as Mr. Winwood Reade informs me, the negroes admire a very black skin more than one of a lighter tint. But their horror of whiteness may be partly attributed, according to this same traveller, to the belief held by most negroes that demons and spirits are white.

The Banyai of the more southern part of the continent are negroes, but "a great many of them are of a light coffee-and-milk color, and, indeed, this color is considered handsome throughout the whole country;" so that here we have a different standard of taste. With the Kaffres, who differ much from negroes, "the skin, except among the tribes near Delagoa Bay, is not usually black, the prevailing color being a mixture of black and red, the most common shade being chocolate. Dark complexions, as being most common, are naturally held in the highest esteem. To be told that he is light-colored, or like a white man, would be deemed a very poor compliment by a Kaffre. I have heard of one unfortunate man who was so very fair that no girl would marry him." One of the titles of the

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[54] 'The Anthropological Review' Nov. 1864, p. 237. For additional references, see Waitz, 'Introduct. to Anthropology,' Eng. translat. 1863, vol. i. p. 105.

Zulu king is, "You who are black."[55] Mr. Galton, in speaking to me about the natives of Southern Africa, remarked that their ideas of beauty seem very different from ours; for in one tribe two slim, slight, and pretty girls were not admired by the natives.

Turning to other quarters of the world: in Java, a yellow, not a white girl, is considered, according to Madame Pfeiffer, a beauty. A man of Cochin-China "spoke with contempt of the wife of the English ambassador, that she had white teeth like a dog, and a rosy color like that of potato-flowers." We have seen that the Chinese dislike our white skin, and that the North Americans admire "a tawny hide." In South America, the Yura-caras, who inhabit the wooded, damp slopes of the eastern Cordillera, are remarkably pale-colored, as their name in their own language expresses; nevertheless, they consider European women as very inferior to their own.[56]

In several of the tribes of North America the hair on the head grows to a wonderful length; and Catlin gives a curious proof how much this is esteemed, for the chief of the Crows was elected to this office from having the longest hair of any man in the tribe, namely ten feet and seven inches. The Aymaras and Quichuas of South America likewise have very long hair; and this, as Mr. D. Forbes informs me, is so much valued for the sake of beauty, that cutting it off was the severest punishment which he could inflict on them. In both halves of the continent the natives sometimes increase the apparent length of their hair by weaving into it fibrous substances. Although the hair on the head is thus cherished, that on the face is considered by the North American Indians "as very vulgar," and every hair is carefully eradicated. This practice prevails throughout the American Continent from Vancouver's Island in the north to Tierra del Fuego in the south. When York Minster, a Fuegian on board the "Beagle" was taken back to his country, the natives told him he ought to pull out the few short hairs on his face. They also threatened a young missionary, who was left for a time with them, to strip him naked, and pluck the hairs from his face and body, yet he was far from a hairy man. This fashion is carried to such an extreme that the Indians of Paraguay eradicate their eyebrows and eyelashes, saying that they do not wish to be like horses.[57]

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[55] 'Mungo Park's Travels in Africa,' 4to, 1816, pp. 53, 131. Burton's statement is quoted by Schaaffhausen, 'Archiv für Anthropolog.' 1866. s. 163. On the Banyai, Livingstone, 'Travels,' p. 64. On the Kafirs. the Rev. J. Shooter, 'The Kafirs of Natal and the Zulu Country,' 1857, p. 1.

[56] For the Javanese and Cochin-Chinese, see Waitz, 'Introduct. to Anthropology,' Eng. translat. vol. i. p. 305. On the Yura-caras, A. d'Orligny, as quoted in Pritchard, 'Phys. Hist. of Mankind,' vol. v. 3d edit. p. 476.

It is remarkable that throughout the world the races which are almost completely destitute of a beard dislike hairs on the face and body, and take pains to eradicate them. The Calmucks are beardless, and they are well known, like the Americans, to pluck out all straggling hairs; and so it is with the Polynesians, some of the Malays, and the Siamese. Mr. Veitch states that the Japanese ladies "all objected to our whiskers, considering them very ugly, and told us to cut them off, and be like Japanese men." The New-Zealanders are beardless; they carefully pluck out the hairs on the face, and have a saying that "there is no woman for a hairy man."[58]

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[57] North American Indians,' by G. Catlin, 3d. edit. 1842, vol. i. p. 49; vol. ii. p. 227. On the natives of Vancouver Island, see Sproat. 'Scenes and Studies of Savage Life,' 1868, p. 25. On the Indians of Paraguay, Azara, 'Voyages,' tom. ii. p. 105.

[58] On the Siamese, Pritchard, ibid. vol. iv. p. 533. On the Japanese, Veitch in 'Gardeners' Chronicle,' 1860, p. 1104. On the New-Zealanders, Mantegazza, 'Viaggi e Studi,' 1867, p. 526. For the other nations men-

On the other hand, bearded races admire and greatly value their beards; among the Anglo-Saxons every part of the body, according to their laws, had a recognized value; "the loss of the beard being estimated at twenty shillings, while the breaking of a thigh was fixed at only twelve."[59] In the East, men swear solemnly by their beards. We have seen that Chinsurdi, the chief of the Makalolo in Africa, evidently thought that beards were a great ornament. With the Fijians in the Pacific the beard is "profuse and bushy, and is his greatest pride;" while the inhabitants of the adjacent archipelagoes of Tonga and Samoa are "beardless, and abhor a rough chin." In one island alone of the Ellice group "the men are heavily bearded, and not a little proud thereof."[60]

We thus see how widely the different races of man differ in their taste for the beautiful. In every nation sufficiently advanced to have made effigies of their gods or of their deified rulers, the sculptors no doubt have endeavored to express their highest ideal of beauty and grandeur.[61] Under this point of view it is well to compare in our mind the Jupiter or Apollo of the Greeks with the Egyptian or Assyrian statues; and these with the hideous bass-reliefs on the ruined buildings of Central America.

I have met with very few statements opposed to the above conclusion. Mr. Winwood Reade, however, who has had ample opportunities for observation, not only with the negroes of the West Coast of Africa, but with

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tioned, see references in Lawrence, 'Lectures on Physiology,' etc. 1822, p. 272.

[59] Lubbock, 'Origin of Civilization,' 1870, p. 321.

[60] Dr. Barnard Davis quotes Mr. Pritchard and others for these facts in regard to the Polynesians, in 'Anthropological Review,' April, 1870, pp. 185, 191.

[61] Ch. Comte has remarks to this effect in his 'Traité de Législation, 3d. edit. 1837, p. 136.

those of the interior who have never associated with Europeans, is convinced that their ideas of beauty are *on the whole* the same as ours. He has repeatedly found that he agreed with negroes in their estimation of the beauty of the native girls; and that their appreciation of the beauty of European women corresponded with ours. They admire long hair, and use artificial means to make it appear abundant; they admire also a beard, though themselves very scantily provided. Mr. Reade feels doubtful what kind of nose is most appreciated: a girl has been heard to say, "I do not want to marry him, he has got no nose;" and this shows that a very flat nose is not an object of admiration. We should, however, bear in mind that the depressed and very broad noses and projecting jaws of the negroes of the West Coast are exceptional types with the inhabitants of Africa. Notwithstanding the foregoing statements, Mr. Reade does not think it probable that negroes would ever prefer the "most beautiful European woman, on the mere grounds of physical admiration, to a good-looking negress."[62]

The truth of the principle, long ago insisted on by Humboldt,[63] that man admires and often tries to exaggerate whatever characters Nature may have given him, is shown in many ways. The practice of beardless races extirpating every trace of a beard, and generally all the hairs on the body, offers one illustration. The skull has been greatly modified during ancient and modern times by many nations; and there can be little doubt that this has been practised, especially in North and South America, in order to exaggerate some natural and admired peculiarity. Many American Indians are known to admire a head flattened to such an extreme degree as to appear to us like that of an idiot. The natives on the north-western coast compress the head into a pointed cone; and it is their constant practice to gather the hair into a knot on the top of the head, for the sake, as Dr. Wilson remarks, "of increasing the apparent elevation of the favorite conoid form." The inhabitants of Arakhan "admire a broad, smooth forehead, and in order to produce it they fasten a plate of lead on the heads of the new-born children." On the other hand, "a broad, well-rounded occiput is considered a great beauty" by the natives of the Fiji islands.[64]

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[62] The Fuegians, as I have been informed by a missionary who long resided with them, consider European women as extremely beautiful; but from what we have seen of the judgment of the other aborigines of America, I cannot but think that this must be a mistake, unless indeed the statement refers to the few Fuegians who have lived for some time with Europeans, and who must consider us as superior beings. I should add that a most experienced observer, Captain Burton, believes that a woman whom we consider beautiful is admired throughout the world, 'Anthropological Review,' March, 1864, p. 245.

[63] 'Personal Narrative,' Eng. translat. vol. iv. p. 518, and elsewhere. Mantegazza, in his 'Viaggi e Studi,' 1867, strongly insists on this same principle.

As with the skull, so with the nose; the ancient Huns during the age of Attila were accustomed to flatten the noses of their infants with bandages, "for the sake of exaggerating a natural conformation." With the Tahitians, to be called *long-nose* is considered as an insult, and they compress the noses and foreheads of their children for the sake of beauty. So it is with the Malays of Sumatra, the Hottentots, certain Negroes, and the natives of Brazil.[65]

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[64] On the skulls of the American tribes, see Nott and Gliddon, 'Types of Mankind,' 1854, p. 440; Pritchard, 'Phys. Hist. of Mankind,' vol. i. 3d edit. p. 321; on the natives of Arakhan, ibid. vol. iv. p. 537. Wilson, 'Physical Ethnology,' Smithsonian Institution, 1863, p. 288; on the Fijians, p. 290. Sir J. Lubbock ('Prehistoric Times,' 2d edit. 1869, p. 506) gives an excellent *résumé* on this subject.

[65] On the Huns, Godron, 'De l'Espèce,' tom. ii. 1859, p. 300. On the Tahitians, Waitz, 'Anthropolog.' Eng. translat. vol. i. p. 305. Marsden,

The Chinese have by nature unusually small feet;[66] and it is well known that the women of the upper classes distort their feet to make them still smaller. Lastly, Humboldt thinks that the American Indians prefer coloring their bodies with red paint in order to exaggerate their natural tint; and until recently European women added to their naturally bright colors by rouge and white cosmetics; but I doubt whether many barbarous nations have had any such intention in painting themselves.

In the fashions of our own dress we see exactly the same principle and the same desire to carry every point to an extreme; we exhibit, also, the same spirit of emulation. But the fashions of savages are far more permanent than ours; and whenever their bodies are artificially modified this is necessarily the case. The Arab women of the Upper Nile occupy about three days in dressing their hair; they never imitate other tribes, "but simply vie with each other in the superlativeness of their own style." Dr. Wilson, in speaking of the compressed skulls of various American races, adds, "Such usages are among the least eradicable, and long survive the shock of revolutions that change dynasties and efface more important national peculiarities."[67] The same principle comes largely into play in the art of selection; and we can thus understand, as I have elsewhere explained,[68] the wonderful development of all the races of animals and plants which are kept merely for ornament. Fanciers always wish each character to be somewhat increased; they do not admire

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quoted by Pritchard, 'Phys. Hist. of Mankind,' 3d edit. vol. v. p. 67. Lawrence, 'Lectures on Physiology,' p. 337.

[66] This fact was ascertained in the 'Reise der *Novara* Anthropolog. Theil,' Dr. Weisbach, 1867, s. 265.

[67] 'Smithsonian Institution,' 1863, p. 289. On the fashions of Arab women, Sir S. Baker, 'The Nile Tributaries,' 1867, p. 121.

[68] 'The Variation of Animals and Plants under Domestication,' vol. i. p. 214; vol. ii. p. 240.

a medium standard; they certainly do not desire any great and abrupt change in the character of their breeds; they admire solely what they are accustomed to behold, but they ardently desire to see each characteristic feature a little more developed.

No doubt the perceptive powers of man and the lower animals are so constituted that brilliant colors and certain forms, as well as harmonious and rhythmical sounds, give pleasure and are called beautiful; but why this should be so, we know no more than why certain bodily sensations are agreeable and others disagreeable. It is certainly not true that there is in the mind of man any universal standard of beauty with respect to the human body. It is, however, possible that certain tastes may in the course of time become inherited, though I know of no evidence in favor of this belief; and if so, each race would possess its own innate ideal standard of beauty. It has been argued[69] that ugliness consists in an approach to the structure of the lower animals, and this no doubt is true with the more civilized nations, in which intellect is highly appreciated; but a nose twice as prominent, or eyes twice as large as usual would not be an approach in structure to any of the lower animals, and yet would be utterly hideous. The men of each race prefer what they are accustomed to behold; they cannot endure any great change; but they like variety, and admire each characteristic point carried to a moderate extreme.[70] Men accustomed to a nearly oval face, to straight and regular features, and to bright colors, admire, as we Europeans know, these points when strongly developed. On the other hand, men accustomed to a broad face, with high cheek-bones, a depressed nose, and a black skin, admire these points strongly developed. No doubt characters of all kinds may easily be too much developed for beauty. Hence a perfect beauty, which implies many characters modified in a particular manner, will in every race be a prodigy. As the great anatomist Bichat long ago said, if every one were cast in the same mould, there would be no such thing as beauty. If all our women were to become as beautiful as the Venus de Medici, we should for a time be charmed; but we should soon wish for variety; and as soon as we had obtained variety, we should wish to see certain characters in our women a little exaggerated beyond the then existing common standard.

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[69] Schaaffhausen, 'Archiv für Anthropologie,' 1866, s. 164.

[70] Mr. Bain has collected ('Mental and Moral Science,' 1868, pp. 304–314) about a dozen more or less different theories of the idea of beauty; but none are quite the same with that here given.

CHAPTER XX.

SECONDARY SEXUAL CHARACTERS OF MAN—*continued.*

On the Effects of the Continued Selection of Women according to a Different Standard of Beauty in each Race.—On the Causes which interfere with Sexual Selection in Civilized and Savage Nations.—Conditions favorable to Sexual Selection during Primeval Times.—On the Manner of Action of Sexual Selection with Mankind.—On the Women in Savage Tribes having some Power to choose their Husbands.—Absence of Hair on the Body, and Development of the Beard.—Color of the Skin.—Summary.

WE have seen in the last chapter that with all barbarous races ornaments, dress, and external appearance, are highly valued; and that the men judge of the beauty of their women by widely-different standards. We must next inquire whether this preference and the consequent selection during many generations of those women, which appear to the men of each race the most attractive, has altered the character either of the females alone or of both sexes. With mammals the general rule appears to be that characters of all kinds are inherited equally by the males and females; we might therefore expect that with mankind any characters gained through sexual selection by the females would commonly be transferred to the offspring of both sexes. If any change has thus been effected it is almost certain that the different races will have been differently modified, as each has its own standard of beauty.

With mankind, especially with savages, many causes interfere with the action of sexual selection as far as the bodily frame is concerned. Civilized men are largely attracted by the mental charms of women, by their wealth, and especially by their social position; for men rarely marry into a much lower rank of life. The men who succeed in obtaining the more beautiful women, will not have a better chance of leaving a long line of descendants than other men with plainer wives, with the exception of the few who bequeath their fortunes according to primogeniture. With respect to the opposite form of selection, namely, of the more attractive men by the women, although in civilized nations women have free or almost free choice, which is not the case with barbarous races, yet their choice is largely influenced by the social position and wealth of the men; and the success of the latter in life largely depends on their intellectual powers and energy, or on the fruits of these same powers in their forefathers.

There is, however, reason to believe that sexual selection has effected something in certain civilized and semi-civilized nations. Many persons are convinced, as it appears to me with justice, that the members of our aristocracy, including under this term all wealthy families in which primogeniture has long prevailed, from having chosen during many generations from all classes the more beautiful women as their wives, have become handsomer, according to the European standard of beauty, than the middle classes; yet the middle classes are placed under equally favorable conditions of life for the perfect development of the body. Cook remarks that the superiority in personal appearance "which is observable in the erees or nobles in all the other islands (of the Pacific) is found in the Sandwich islands;" but this may be chiefly due to their better food and manner of life.

The old traveller Chardin, in describing the Persians, says their "blood is now highly refined by frequent intermixtures with the Georgians and Circassians, two nations which surpass all the world in personal beauty. There is hardly a man of rank in Persia who is not born of a Georgian or Circassian mother." He adds that they inherit their beauty, "not from their ancestors, for without the above mixture, the men of rank in Persia, who are descendants of the Tartars, would be extremely ugly."[1] Here is a more curious case: the priestesses who attended the temple of Venus Erycina at San-Giuliano in Sicily, were selected for their beauty out of the whole of Greece; they were not vestal virgins, and Quatrefages,[2] who makes this statement, says that the women of San-Giuliano are famous at the present day as the most beautiful in the island, and are sought by artists as models. But it is obvious that the evidence in the above cases is doubtful.

The following case, though relating to savages, is well worth giving from its curiosity. Mr. Winwood Reade informs me that the Jollofs, a tribe of negroes on the west coast of Africa, "are remarkable for their uniformly fine appearance." A friend of his asked one of these men, "How is it that every one whom I meet is so fine-looking, not only your men, but your women?" The Jollof answered, "It is very easily explained: it has always been our custom to pick out our worse-looking slaves and to sell them." It need hardly be added that with all savages female slaves serve as concubines. That this negro should have attributed, whether rightly or wrongly, the fine appearance of his tribe to the long-continued elimination of the ugly women, is not so surprising as it may at first appear; for I have elsewhere shown that negroes fully appreciate the importance of selection in the breeding of their domestic animals,[3] and I could give from Mr. Reade additional evidence on this head.

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[1] These quotations are taken from Lawrence ('Lectures on Physiology, etc. 1822, p. 393), who attributes the beauty of the upper classes in England to the men having long selected the more beautiful women.

[2] "Anthropologie," 'Revue des Cours Scientifiques,' Oct. 1868, p. 721.

On the Causes which prevent or check the Action of Sexual Selection with Savages.—The chief causes are, firstly, so-called communal marriages or promiscuous intercourse; secondly, infanticide, especially of female infants; thirdly, early betrothals; and lastly, the low estimation in which women are held, as mere slaves. These four points must be considered in some detail.

It is obvious that as long as the pairing of man, or of any other animal, is left to chance, with no choice exerted by either sex, there can be no sexual selection; and no effect will be produced on the offspring by certain individuals having had an advantage over others in their courtship. Now it is asserted that there exist at the present day tribes which practise what Sir J. Lubbock by courtesy calls communal marriages; that is, all the men and women in the tribe are husbands and wives to each other. The licentiousness of many savages is no doubt astonishingly great, but it seems to me that more evidence is requisite before we fully admit that their existing intercourse is absolutely promiscuous. Nevertheless all those who have most closely studied the subject,[4] and whose judgment is worth much more than mine, believe that communal marriage was the original and universal form throughout the world, including the intermarriage of brothers and sisters. The indirect evidence in favor of this belief is extremely strong, and rests chiefly on the terms of relationship which are employed between the members of the same tribe, implying a connection with the tribe alone, and not with either parent. But the subject is too large and complex for even an abstract to be here given, and I will confine myself to a few remarks. It is evident in the case of communal marriages, or where the marriage-tie is very loose, that the relationship of the child to its father cannot be known. But it seems almost incredible that the relationship of the child to its mother should ever have been completely ignored, especially as the women in most savage tribes nurse their infants for a long time. Accordingly in many cases the lines of descent are traced through the mother alone, to the exclusion of the father. But in many other cases the terms employed express a connection with the tribe alone, to the exclusion even of the mother. It seems possible that the connection between the related members of the same barbarous tribe, exposed to all sorts of danger, might be so much more important, owing to the need of mutual protection and aid, than that between the mother and her child, as to lead to the sole use of terms expressive of the former relationships; but Mr. Morgan is convinced that this view of the case is by no means sufficient.

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[3] 'The Variation of Animals and Plants under Domestication,' vol. i. p. 207

[4] Sir J. Lubbock, 'The Origin of Civilization,' 1870, chap. iii. especially pp. 60–67. Mr. McLennan, in his extremely valuable work on 'Primitive Marriage,' 1865, p. 163, speaks of the union of the sexes "in the earliest times as loose, transitory, and in some degree promiscuous." Mr. McLennan and Sir J. Lubbock have collected much evidence on the extreme licentiousness of savages at the present time. Mr. L. H. Morgan, in his interesting memoir on the classificatory system of relationship ('Proc. American Acad. of Sciences,' vol. vii. Feb. 1868, p. 475) concludes that polygamy and all forms of marriage during primeval times

The terms of relationship used in different parts of the world may be divided, according to the author just quoted, into two great classes, the classificatory and descriptive—the latter being employed by us. It is the

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were essentially unknown. It appears, also, from Sir J. Lubbock's work, that Bachofen likewise believes that communal intercourse originally prevailed.

classificatory system which so strongly leads to the belief that communal and other extremely loose forms of marriage were originally universal. But, as far as I can see, there is no necessity on this ground for believing in absolutely promiscuous intercourse. Men and women, like many of the lower animals, might formerly have entered into strict though temporary unions for each birth, and in this case nearly as much confusion would have arisen in the terms of relationship as in the case of promiscuous intercourse. As far as sexual selection is concerned, all that is required is that choice should be exerted before the parents unite, and it signifies little whether the unions last for life or only for a season.

Besides the evidence derived from the terms of relationship, other lines of reasoning indicate the former wide prevalence of communal marriage. Sir J. Lubbock ingeniously accounts[5] for the strange and widely-extended habit of exogamy—that is, the men of one tribe always taking wives from a distinct tribe—by communism having been the original form of marriage; so that a man never obtained a wife for himself unless he captured her from a neighboring and hostile tribe, and then she would naturally have become his sole and valuable property. Thus the practice of capturing wives might have arisen; and from the honor so gained might ultimately have become the universal habit. We can also, according to Sir J. Lubbock,[5] thus understand "the necessity of expiation for marriage as an infringement of tribal rites, since, according to old ideas, a man had no right to appropriate to himself that which belonged to the whole tribe." Sir J. Lubbock further gives a most curious body of facts showing that in old times high honor was bestowed on women who were utterly licentious; and this, as he explains, is intelligible, if we admit that promiscuous intercourse was the aboriginal and therefore long-revered custom of the tribe.[6]

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[5] Address to British Association 'On the Social and Religious Condition of the Lower Races of Man,' 1870, p. 20.

Although the manner of development of the marriage-tie is an obscure subject, as we may infer from the divergent opinions on several points between the three authors who have studied it most closely, namely, Mr. Morgan, Mr. McLennan, and Sir J. Lubbock, yet from the foregoing and several other lines of evidence it seems certain that the habit of marriage has been gradually developed, and that almost promiscuous intercourse was once extremely common throughout the world. Nevertheless, from the analogy of the lower animals, more particularly of those which come nearest to man in the series, I cannot believe that this habit prevailed at an extremely remote period, when man had hardly attained to his present rank in the zoological scale. Man, as I have attempted to show, is certainly descended from some ape-like creature. With the existing Quadrumana, as far as their habits are known, the males of some species are monogamous, but live during only a part of the year with the females, as seems to be the case with the Orang. Several kinds, as some of the Indian and American monkeys, are strictly monogamous, and associate all the year round with their wives. Others are polygamous, as the Gorilla and several American species, and each family lives separate. Even when this occurs, the families inhabiting the same district are probably to a certain extent social: the Chimpanzee, for instance, is occasionally met with in large bands. Again, other species are polygamous, but several males, each with their own females, live associated in a body, as with several species of Baboons.[7] We may indeed conclude from what we know of the jealousy of all male quadrupeds, armed, as many of them are, with special weapons for battling with their rivals, that promiscuous intercourse in a state of nature is extremely improbable. The pairing may not last for life, but only for each birth; yet if the males which are the strongest and best able to defend or otherwise assist their females and young offspring, were to select the more attractive females, this would suffice for the work of sexual selection.

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[6] 'Origin of Civilization,' 1870, p. 86. In the several works above quoted there will be found copious evidence on relationship through the females alone, or with the tribe alone.

Therefore, if we look far enough back in the stream of time, it is extremely improbable that primeval men and women lived promiscuously together. Judging from the social habits of man as he now exists, and from most savages being polygamists, the most probable view is that primeval man aboriginally lived in small communities, each with as many wives as he could support and obtain, whom he would have jealously guarded against all other men. Or he may have lived with several wives by himself, like the Gorilla; for all the natives "agree that but one adult male is seen in a band; when the young male grows up, a contest takes place for mastery, and the strongest, by killing and driving out the others, establishes himself as the head of the community."[8] The younger males, being thus expelled and wandering about, would, when at last successful in finding a partner, prevent too close interbreeding within the limits of the same family.

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[7] Brehm ('Illust. Thierleben,' B. i. p. 77) says *Cynocephalus hamadryas* lives in great troops containing twice as many adult females as adult males. See Rengger on American polygamous species, and Owen ('Anat. of Vertebrates,' vol. iii. p. 746) on American monogamous species. Other references might be added.

[8] Dr. Savage, in 'Boston Journal of Nat. Hist.' vol. v. 1845–'47, p. 423.

Although savages are now extremely licentious, and although communal marriages may formerly have largely prevailed, yet many tribes practise some form of marriage, but of a far more lax nature than with civilized nations. Polygamy, as just stated, is almost universally followed by the leading men in every tribe. Nevertheless, there are tribes, standing almost at the bottom of the scale, which are strictly monogamous. This is the case with the Veddahs of Ceylon: they have a saying, according to Sir J. Lubbock,[9] "that death alone can separate husband and wife." An intelligent Kandyan chief, of course a polygamist, "was perfectly scandalized at the utter barbarism of living with only one wife, and never parting until separated by death." It was, he said, "just like the Wanderoo monkeys." Whether savages who now enter into some form of marriage, either polygamous or monogamous, have retained this habit from primeval times, or whether they have returned to some form of marriage, after passing through a stage of promiscuous intercourse, I will not pretend to conjecture.

Infanticide.—This practice is now very common throughout the world, and there is reason to believe that it prevailed much more extensively during former times.[10] Barbarians find it difficult to support themselves and their children, and it is a simple plan to kill their infants. In South America some tribes, as Azara states, formerly destroyed so many infants of both sexes, that they were on the point of extinction. In the Polynesian Islands women have been known to kill from four or five to even ten of their children; and Ellis could not find a single woman who had not killed at least one. Wherever infanticide

[9] 'Prehistoric Times,' 1869, p. 424.

[10] Mr. McLennan, 'Primitive Marriage,' 1865. See especially on exogamy and infanticide, pp. 130, 138, 165.

prevails the struggle for existence will be in so far less severe, and all the members of the tribe will have an almost equally good chance of rearing their few surviving children. In most cases a larger number of female than of male infants are destroyed, for it is obvious that the latter are of most value to the tribe, as they will when grown up aid in defending it, and can support themselves. But the trouble experienced by the women in rearing children, their consequent loss of beauty, the higher estimation set on them and their happier fate, when few in number, are assigned by the women themselves, and by various observers, as additional motives for infanticide. In Australia, where female infanticide is still common, Sir G. Grey estimated the proportion of native women to men as one to three; but others say as two to three. In a village on the eastern frontier of India, Colonel Macculloch found not a single female child.[11]

When, owing to female infanticide, the women of a tribe are few in number, the habit of capturing wives from neighboring tribes would naturally arise. Sir J. Lubbock, however, as we have seen, attributes the practice, in chief part, to the former existence of communal marriage, and to the men having consequently captured women from other tribes to hold as their sole property. Additional causes might be assigned, such as the communities being very small, in which case, marriageable women would often be deficient. That the habit of capture was most extensively practised during former times, even by the ancestors of civilized nations, is clearly shown by the preservation of many curious customs and ceremonies, of which Mr. McLennan has given a most interesting account. In our own marriages the "best man" seems originally to have been the chief abettor of the bridegroom in the act of capture. Now, as long as men habitually procured their wives through violence and craft, it is not probable that they would have selected the more attractive women; they would have been too glad to have seized on any woman. But as soon as the practice of procuring wives from a distinct tribe was effected through barter, as now occurs in many places, the more attractive women would generally have been purchased. The incessant crossing, however, between tribe and tribe, which necessarily follows from any form of this habit would have tended to keep all the people inhabiting the same country nearly uniform in character; and this would have greatly interfered with the power of sexual selection in differentiating the tribes.

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[11] Dr. Garland ('Ueber das Aussterben der Naturvölker,' 1868) has collected much information on infanticide, see especially s. 27, 51, 54. Azara ('Voyages,' etc., tom. ii. pp. 94, 116) enters in detail on the motives. See also McLennan (ibid. p. 139) for cases in India.

The scarcity of women, consequent on female infanticide, leads also to another practice, namely, polyandry, which is still common in several parts of the world, and which formerly, as Mr. McLennan believes, prevailed almost universally; but this latter conclusion is doubted by Mr. Morgan and Sir J. Lubbock.[12] Whenever two or more men are compelled to marry one woman, it is certain that all the women of the tribe will get married, and there will be no selection by the men of the more attractive women. But, under these circumstances, the women no doubt will have the power of choice, and will prefer the more attractive men. Azara, for instance, describes how carefully a Guana woman bargains for all sorts of privileges before accepting some one or more husbands; and the men in consequence take unusual care of their personal appearance.[13] The very ugly men would perhaps altogether fail in getting a wife, or get one later in life, but the handsomer men, although the most successful in obtaining wives, would not, as far as we can see, leave more offspring to inherit their beauty than the less handsome husbands of the same women.

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[12] 'Primitive Marriage,' p. 208; Sir J. Lubbock, 'Origin of Civilization,' p. 100. See also Mr. Morgan, loc. cit., on former prevalence of polyandry.

Early Betrothals and Slavery of Women.—With many savages it is the custom to betroth the females while mere infants; and this would effectually prevent preference being exerted, on either side, according to personal appearance. But it would not prevent the more attractive women from being afterward stolen or taken by force from their husbands by the more powerful men; and this often happens in Australia, America, and other parts of the world. The same consequences with reference to sexual selection would to a certain extent follow when women are valued almost exclusively as slaves or beasts of burden, as is the case with most savages. The men, however, at all times would prefer the handsomest slaves according to their standard of beauty.

We thus see that several customs prevail with savages which would greatly interfere with, or completely stop, the action of sexual selection. On the other hand, the conditions of life to which savages are exposed, and some of their habits, are favorable to natural selection; and this always comes into play together with sexual selection. Savages are known to suffer severely from recurrent famines; they do not increase their food by artificial means; they rarely refrain from marriage,[14] and generally marry young. Consequently they must be subjected to occasional hard struggles for existence, and the favored individuals will alone survive.

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[13] 'Voyages,' etc., tom. ii. pp. 92–95.

[14] Burchell says ('Travels in South Africa,' vol. ii. 1824, p. 58), that among the wild nations of Southern Africa, neither men nor women ever pass their lives in a state of celibacy. Azara ('Voyages dans l'Amériqua

Turning to primeval times when men had only doubtfully attained the rank of manhood, they would probably have lived, as already stated, either as polygamists or temporarily as monogamists. Their intercourse, judging from analogy, would not then have been promiscuous. They would, no doubt, have defended their females to the best of their power from enemies of all kinds, and would probably have hunted for their subsistence, as well as for that of their offspring. The most powerful and able males would have succeeded best in the struggle for life and in obtaining attractive females. At this early period the progenitors of man, from having only feeble powers of reason, would not have looked forward to distant contingencies. They would have been governed more by their instincts and even less by their reason than are savages at the present day. They would not at that period have partially lost one of the strongest of all instincts, common to all the lower animals, namely, the love of their young offspring; and consequently they would not have practised infanticide. There would have been no artificial scarcity of women, and polyandry would not have been followed; there would have been no early betrothals; women would not have been valued as mere slaves; both sexes, if the females as well as the males were permitted to exert any choice, would have chosen their partners, not for mental charms, or property, or social position, but almost solely from external appearance. All the adults would have married or paired, and all the offspring, as far as that was possible, would have been reared; so that the struggle for existence would

Merid.' tom. ii. 1809, p. 21) makes precisely the same remark in regard to the wild Indians of South America.

have been periodically severe to an extreme degree. Thus during these primordial times all the conditions for sexual selection would have been much more favorable than at a later period, when man had advanced in his intellectual powers, but had retrograded in his instincts. Therefore, whatever influence sexual selection may have had in producing the differences between the races of man, and between man and the higher Quadrumana, this influence would have been much more powerful at a very remote period than at the present day.

On the Manner of Action of Sexual Selection with Mankind.—With primeval men under the favorable conditions just stated, and with those savages who at the present time enter into any marriage-tie (but subject to greater or less interference according as the habits of female infanticide, early betrothals, etc., are more or less practised), sexual selection will probably have acted in the following manner: The strongest and most vigorous men—those who could best defend and hunt for their families, and during later times the chiefs or head-men—those who were provided with the best weapons and who possessed the most property, such as a larger number of dogs or other animals, would have succeeded in rearing a greater average number of offspring, than would the weaker, poorer, and lower members of the same tribes. There can, also, be no doubt that such men would generally have been able to select the more attractive women. At present the chiefs of nearly every tribe throughout the world succeed in obtaining more than one wife. Until recently, as I hear from Mr. Mantell, almost every girl in New Zealand, who was pretty, or promised to be pretty, was *tapu* to some chief. With the Kaffres, as Mr. C. Hamilton states,[15] "the chiefs generally have the pick of the women for many miles round, and are most persevering in establishing or confirming their privilege." We have seen that each race has its own style of beauty, and we know that it is natural to man to admire each characteristic point in his domestic animals, dress, ornaments, and personal appearance, when carried a little beyond the common standard. If, then, the several foregoing propositions be admitted, and I cannot see that they are doubtful, it would be an inexplicable circumstance, if the selection of the more attractive women by the more powerful men of each tribe, who would rear on an average a greater number of children, did not after the lapse of many generations modify to a certain extent the character of the tribe.

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[15] 'Anthropological Review,' Jan. 1870, p. xvi.

With our domestic animals, when a foreign breed is introduced into a new country, or when a native breed is long and carefully attended to, either for use or ornament, it is found after several generations to have undergone, whenever the means of comparison exist, a greater or less amount of change. This follows from unconscious selection during a long series of generations—that is, the preservation of the most approved individuals—without any wish or expectation of such a result on the part of the breeder. So, again, if two careful breeders rear during many years animals of the same family, and do not compare them together or with a common standard, the animals are found after a time to have become, to the surprise of their owners, slightly different.[16] Each breeder has impressed, as Von Nathusius well expresses it, the character of his own mind—his own taste and judgment—on his animals. What reason, then, can be assigned why similar results should not follow from the long-continued selection of the most admired women by those men of each tribe who were able to rear to maturity the greater number of children? This would be unconscious selection, for an effect would be produced, independently of any wish or expectation on the part of the men who preferred certain women to others.

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[16] 'The Variation of Animals and Plants under Domestication,' vol. ii. pp. 210–217.

Let us suppose the members of a tribe, in which some form of marriage was practised, to spread over an unoccupied continent; they would soon split up into distinct hordes, which would be separated from each other by various barriers, and still more effectually by the incessant wars between all barbarous nations. The hordes would thus be exposed to slightly different conditions and habits of life, and would sooner or later come to differ in some small degree. As soon as this occurred, each isolated tribe would form for itself a slightly different standard of beauty;[17] and then unconscious selection would come into action through the more powerful and leading savages preferring certain women to others. Thus the differences between the tribes, at first very slight, would gradually and inevitably be increased to a greater and greater degree.

With animals in a state of nature, many characters proper to the males, such as size, strength, special weapons, courage and pugnacity, have been acquired through the law of battle. The semi-human progenitors of man, like their allies the Quadrumana, will almost certainly have been thus modified; and, as savages still fight for the possession of their women, a similar process of selection has probably gone on in a greater or less degree to the present day. Other characters proper to the males of the lower animals, such as bright colors and various ornaments, have been acquired by the more attractive males having been preferred by the females. There are, however, exceptional cases in which the males, instead of having been the selected, have been the selectors. We recognize such cases by the females having been rendered more highly ornamented than the males—their ornamental characters having been transmitted exclusively or chiefly to their female offspring. One such case has been described in the order to which man belongs, namely, with the Rhesus monkey.

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[17] An ingenious writer argues, from a comparison of the pictures of Raphael, Rubens, and modern French artists, that the idea of beauty is not absolutely the same even throughout Europe: see the 'Lives of Haydn and Mozart,' by M. Pombet, Eng. translat. p. 278.

Man is more powerful in body and mind than woman, and in the savage state he keeps her in a far more abject state of bondage than does the male of any other animal; therefore it is not surprising that he should have gained the power of selection. Women are everywhere conscious of the value of their beauty; and when they have the means, they take more delight in decorating themselves with all sorts of ornaments than do men. They borrow the plumes of male birds, with which Nature decked this sex in order to charm the females. As women have long been selected for beauty, it is not surprising that some of the successive variations should have been transmitted in a limited manner; and consequently that women should have transmitted their beauty in a somewhat higher degree to their female than to their male offspring. Hence women have become more beautiful, as most persons will admit, than men. Women, however, certainly transmit most of their characters, including beauty, to their offspring of both sexes; so that the continued preference by the men of each race of the more attractive women, according to their standard of taste, would tend to modify in the same manner all the individuals of both sexes belonging to the race.

With respect to the other form of sexual selection (which with the lower animals is much the most common), namely, when the females are the selectors, and accept only those males which excite or charm them most, we have reason to believe that it formerly acted on the progenitors of man. Man in all probability owes his beard, and perhaps some other characters, to inheritance from an ancient progenitor who gained in this manner his ornaments. But this form of selection may have occasionally acted during later times; for in utterly barbarous tribes the women have more power in choosing, rejecting, and tempting their lovers, or of afterward changing their husbands, than might have been expected. As this is a point of some importance, I will give in detail such evidence as I have been able to collect.

Hearne describes how a woman in one of the tribes of Arctic America repeatedly ran away from her husband and joined a beloved man; and with the Charruas of South America, as Azara states, the power of divorce is perfectly free. With the Abipones, when a man chooses a wife he bargains with the parents about the price. But, "it frequently happens that the girl rescinds what has been agreed upon between the parents and the bridegroom, obstinately rejecting the very mention of marriage." She often runs away, hides herself, and thus eludes the bridegroom. In the Fiji Islands the man seizes on the woman whom he wishes for his wife by actual or pretended force; but "on reaching the home of her abductor, should she not approve of the match, she runs to some one who can protect her; if, however, she is satisfied, the matter is settled forthwith." In Tierra del Fuego a young man first obtains the consent of the parents by doing them some service, and then he attempts to carry off the girl; "but if she is unwilling, she hides herself in the woods until her admirer is heartily tired of looking for her, and gives up the pursuit; but this seldom happens." With the Calmucks there is a regular race between the bride and bridegroom, the former having a fair start; and Clarke "was assured that no instance occurs of a girl being caught, unless she has a partiality to the pursuer." So with the wild tribes of the Malay archipelago there is a similar racing-match; and it appears from M. Bourien's account, as Sir J. Lubbock remarks, that "the race 'is not to the swift, nor the battle to the strong,' but to the young man who has the good fortune to please his intended bride."

Turning to Africa: the Kaffres buy their wives, and girls are severely beaten by their fathers if they will not accept a chosen husband; yet it is manifest from many facts given by the Rev. Mr. Shooter, that they have considerable power of choice. Thus very ugly, though rich men, have been known to fail in getting wives. The girls, before consenting to be betrothed, compel the men to show themselves off, first in front and then behind, and "exhibit their paces." They have been known to propose to a man, and they not rarely run away with a favored lover. With the degraded Bushwomen of South Africa, "when a girl has grown up to womanhood without having been betrothed, which, however, does not often happen, her lover must gain her approbation, as well as that of the parents."[18] Mr. Winwood Reade made inquiries for me with respect to the negroes of Western Africa, and he informs me that "the women, at least among the more intelligent pagan tribes, have no difficulty in getting the husbands whom they may desire, although it is considered unwomanly to ask a man to marry them. They are quite capable of falling in love, and of forming tender, passionate, and faithful attachments."

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[18] Azara, 'Voyages,' etc. tom. ii. p. 23. Dobrizhoffer, 'An account of the Abipones,' vol. ii. 1822, p. 207. Williams on the Fiji Islanders, as quoted by Lubbock, 'Origin of Civilization,' 1870, p. 79. On the Fuegians, King and Fitz Roy, 'Voyages of the *Adventure* and *Beagle*,' vol. ii. 1839, p. 182. On the Calmucks, quoted by McLennan, 'Primitive Marriage,' 1865, p. 32. On the Malays, Lubbock, ibid. p. 76. The Rev. J. Shooter, 'On the Kafirs of Natal,' 1857,' pp. 52–60. On the Bushwomen, Burchell, 'Travels in South Africa,' vol. ii. 1824, p. 59.

We thus see that with savages the women are not in quite so abject a state in relation to marriage as has often been supposed. They can tempt the men whom they prefer, and can sometimes reject those whom they dislike, either before or after marriage. Preference on the part of the women, steadily acting in any one direction, would ultimately affect the character of the tribe; for the women would generally choose not merely the handsomer men, according to their standard of taste, but those who were at the same time best able to defend and support them. Such well-endowed pairs would commonly rear a larger number of offspring than the less well endowed. The same result would obviously follow in a still more marked manner if there was selection on both sides; that is, if the more attractive and at the same time more powerful men were to prefer, and were preferred by, the more attractive women. And these two forms of selection seem actually to have occurred, whether or not simultaneously, with mankind, especially during the earlier periods of our long history.

We will now consider in a little more detail, relatively to sexual selection, some of the characters which distinguish the several races of man from each other and from the lower animals, namely, the more or less complete absence of hair from the body and the color of the skin. We need say nothing about the great diversity in the shape of the features and of the skull between the different races, as we have seen in the last chapter how different is the standard of beauty in these respects. These characters will therefore probably have been acted on through sexual selection; but we have no means of judging, as far as I can see, whether they have been acted on chiefly through the male or female side. The musical faculties of man have likewise been already discussed.

Absence of Hair on the Body, and its Development on the Face and Head.—From the presence of the woolly hair or lanugo on the human fœtus, and of rudimentary hairs scattered over the body during maturity, we may infer that man is descended from some animal which was born hairy and remained so during life. The loss of hair is an inconvenience and probably an injury to man even under a hot climate, for he is thus exposed to sudden chills, especially during wet weather. As Mr. Wallace remarks, the natives in all countries are glad to protect their naked backs and shoulders with some slight covering. No one supposes that the nakedness of the skin is any direct advantage to man, so that his body cannot have been divested of hair through natural selection.[19] Nor have we any grounds for believing, as shown in a former chapter, that this can be due to the direct action of the conditions to which man has long been exposed, or that it is the result of correlated development.

The absence of hair on the body is to a certain extent a secondary sexual character; for in all parts of the world women are less hairy than men. Therefore we may reasonably suspect that this is a character which has been gained through sexual selection. We know that the faces of several species of monkeys, and large surfaces at the posterior end of the body in other species, have been denuded of hair; and this we may safely attribute to sexual selection, for these surfaces are not only vividly colored, but sometimes, as with the male mandrill and female rhesus, much more vividly in the one sex than in the other. As these animals gradually reach maturity the naked surfaces, as I am informed by Mr. Bartlett, grow larger, relatively to the size of their bodies. The hair, however, appears to have been removed in these cases, not for the sake of nudity, but that the color of the skin should be more fully displayed. So, again, with many birds the head and neck have been divested of feathers through sexual selection, for the sake of exhibiting the brightly-colored skin.

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[19] 'Contributions to the Theory of Natural Selection,' 1870, p. 346. Mr. Wallace believes (p. 350) "that some intelligent power has guided or determined the development of man;" and he considers the hairless condition of the skin as coming under this head. The Rev. T. R. Stebbing, in commenting on this view ('Transactions of Devonshire Assoc. for Science,' 1870) remarks that, had Mr. Wallace "employed his usual ingenuity on the question of man's hairless skin, he might have seen the possibility of its selection through its superior beauty or the health attaching to superior cleanliness. At any rate it is surprising that he should picture to himself a superior intelligence plucking the hair from the backs of savage men (to whom, according to his own account, it would have been useful and beneficial), in order that the descendants of the poor shorn wretches might, after many deaths from cold and damp in the course of many generations," have been forced to raise themselves in the scale of civilization through the practice of various arts, in the manner indicated by Mr. Wallace.

As woman has a less hairy body than man, and as this character is common to all races, we may conclude that our female semi-human progenitors were probably first partially divested of hair; and that this occurred at an extremely remote period before the several races had diverged from a common stock. As our female progenitors gradually acquired this new character of nudity, they must have transmitted it in an almost equal degree to their young offspring of both sexes; so that its transmission, as in the case of many ornaments with mammals and birds, has not been limited either by age or sex. There is nothing surprising in a partial loss of hair having been esteemed as ornamental by the ape-like progenitors of man, for we have seen that with animals of all kinds innumerable strange characters have been thus esteemed, and have consequently been modified through sexual selection. Nor is it surprising that a character in a slight degree injurious should have been thus acquired; for we know that this is the case with the plumes of some birds, and with the horns of some stags.

The females of certain anthropoid apes, as stated in a former chapter, are somewhat less hairy on the under surface than are the males; and here we have what might have afforded a commencement for the process of denudation. With respect to the completion of the process through sexual selection, it is well to bear in mind the New-Zealand proverb, "There is no woman for a hairy man." All who have seen photographs of the Siamese hairy family will admit how ludicrously hideous is the opposite extreme of excessive hairiness. Hence the King of Siam had to bribe a man to marry the first hairy woman in the family, who transmitted this character to her young offspring of both sexes.[20]

Some races are much more hairy than others, especially on the male side; but it must not be assumed that the more hairy races, for instance Europeans, have retained a primordial condition more completely than have the naked races, such as the Calmucks or Americans. It is a more probable view that the hairiness of the former is due to partial reversion, for characters which have long been inherited are always apt to return. It does not appear that a cold climate has been influential in leading to this kind of reversion; excepting perhaps with the negroes, who have been reared during several generations, in the United States,[21] and possibly with the Ainos, who inhabit the northern islands of the Japan archipelago. But the laws of inheritance are so complex that we can seldom understand their action. If the greater hairiness of certain races be the result of reversion, unchecked by any form of selection, the extreme variability of this character, even within the limits of the same race, ceases to be remarkable.

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[20] 'The Variation of Animals and Plants under Domestication,' vol. ii. 1868, p. 327.

[21] 'Investigations into Military and Anthropological Statistics of American Soldiers,' by B. A. Gould, 1869; p. 568: Observations were carefully made on the pilosity of 2,129 black and colored soldiers, while they were bathing; and, by looking to the published table, "it is manifest at a glance that there is but little, if any, difference between the white and the black races in this respect." It is, however, certain that negroes in their native and much hotter land of Africa, have remarkably

With respect to the beard, if we turn to our best guide, namely the Quadrumana, we find beards equally well developed in both sexes of many species, but in others, either confined to the males, or more developed in them than in the females. From this fact, and from the curious arrangement, as well as the bright colors, of the hair about the heads of many monkeys, it is highly probable, as before explained, that the males first acquired their beards as an ornament through sexual selection, transmitting them in most cases, in an equal or nearly equal degree, to their offspring of both sexes. We know from Eschricht[22] that, with mankind, the female as well as the male fœtus is furnished with much hair on the face, especially round the mouth; and this indicates that we are descended from a progenitor of which both sexes were bearded. It appears therefore at first sight probable that man has retained his beard from a very early period, while woman lost her beard at the same time when her body became almost completely divested of hair. Even the color of the beard with mankind seems to

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smooth bodies. It should be particularly observed that pure blacks and mulattoes were included in the above enumeration; and this is an unfortunate circumstance, as in accordance with the principle, the truth of which I have elsewhere proved, crossed races would be eminently liable to revert to the primordial hairy character of their early ape-like progenitors.

[22] "Ueber die Richtung der Haare am Menschlichen Körper," in Müller's 'Archiv für Anat. und Phys.' 1837, s. 40.

have been inherited from an ape-like progenitor; for when there is any difference in tint between the hair of the head and the beard, the latter is lighter colored in all monkeys and in man. There is less improbability in the men of the bearded races having retained their beards from primordial times, than in the case of the hair on the body; for with those Quadrumana, in which the male has a larger beard than that of the female, it is fully developed only at maturity, and the later stages of development may have been exclusively transmitted to mankind. We should then see what is actually the case, namely, our male children, before they arrive at maturity, as destitute of beards as are our female children. On the other hand, the great variability of the beard within the limits of the same race and in different races indicates that reversion has come into action. However this may be, we must not overlook the part which sexual selection may have played even during later times; for we know that, with savages, the men of the beardless races take infinite pains in eradicating every hair from their faces, as something odious, while the men of the bearded races feel the greatest pride in their beards. The women, no doubt, participate in these feelings, and if so sexual selection can hardly have failed to have effected something in the course of later times.[23]

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[23] Mr. Sproat ('Scenes and Studies of Savage Life,' 1868, p. 25) suggests, with reference to the beardless natives of Vancouver's Island, that the custom of plucking out the hairs on the face, "continued from one generation to another, would perhaps at last produce a race distinguishable by a thin and straggling growth of beard." But the custom would not have arisen until the beard had already become, from some independent cause, greatly reduced. Nor have we any direct evidence that the continued eradication of the hair would lead to any inherited effect. Owing to this cause of doubt, I have not hitherto alluded to the belief held by some distinguished ethnologists, for instance M. Gosse of Geneva, that artificial modifications of the skull tend to be inherited. I have

It is rather difficult to form a judgment how the long hair on our heads became developed. Eschricht [24] states that in the human fœtus the hair on the face during the fifth month is longer than that on the head; and this indicates that our semi-human progenitors were not furnished with long tresses, which consequently must have been a late acquisition. This is likewise indicated by the extraordinary difference in the length of the hair in the different races; in the negro the hair forms a mere curly mat; with us it is of great length, and with the American natives it not rarely reaches to the ground. Some species of Semnopithecus have their heads covered with moderately long hair, and this probably serves as an ornament and was acquired through sexual selection. The same view may be extended to mankind, for we know that long tresses are now and were formerly much admired, as may be observed in the works of almost every poet; St. Paul says, "If a woman have long hair, it is a glory to her;" and we have seen that in North America a chief was elected solely from the length of his hair.

Color of the Skin.—The best kind of evidence that the color of the skin has been modified through sexual selection is wanting in the case of mankind; for the sexes do not differ in this respect, or only slightly and doubtfully. On the other hand, we know from many facts already given that the color of the skin is regarded by the men of all races as a highly-important element in their beauty; so that it is a character which would be likely to be modified through selection, as has occurred in innumer-

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no wish to dispute this conclusion; and we now know from Dr. Brown-Séquard's remarkable observations, especially those recently communicated (1870) to the British Association, that with guinea-pigs the effects of operations are inherited.

[24] 'Ueber die Richtung,' ibid. s. 40.

able instances with the lower animals. It seems at first sight a monstrous supposition that the jet blackness of the negro has been gained through sexual selection; but this view is supported by various analogies, and we know that negroes admire their own blackness. With mammals, when the sexes differ in color, the male is often black or much darker than the female; and it depends merely on the form of inheritance whether this or any other tint shall be transmitted to both sexes or to one alone. The resemblance of *Pithecia satanas* with his jet-black skin, white rolling eyeballs, and hair parted on the top of the head, to a negro in miniature, is almost ludicrous.

The color of the face differs much more widely in the various kinds of monkeys than it does in the races of man; and we have good reason to believe that the red, blue, orange, almost white and black tints of their skin, even when common to both sexes, and the bright colors of their fur, as well as the ornamental tufts of hair about the head, have all been acquired through sexual selection. As the newly-born infants of the most distinct races do not differ nearly as much in color as do the adults, although their bodies are completely destitute of hair, we have some slight indication that the tints of the different races were acquired subsequently to the removal of the hair, which, as before stated, must have occurred at a very early period.

Summary.—We may conclude that the greater size, strength, courage, pugnacity, and even energy of man, in comparison with the same qualities in woman, were acquired during primeval times, and have subsequently been augmented, chiefly through the contests of rival males for the possession of the females. The greater intellectual vigor and power of invention in man are probably due to natural selection combined with the inherited effects of habit, for the most able men will have succeeded best in defending and providing for themselves, their wives and offspring. As far as the extreme intricacy of the subject permits us to judge, it appears that our male ape-like progenitors acquired their beards as an ornament to charm or excite the opposite sex, and transmitted them to man as he now exists. The females apparently were first denuded of hair in like manner as a sexual ornament; but they transmitted this character almost equally to both sexes. It is not improbable that the females were modified in other respects for the same purpose and through the same means; so that women have acquired sweeter voices and become more beautiful than men.

It deserves particular attention that with mankind all the conditions for sexual selection were much more favorable, during a very early period, when man had only just attained to the rank of manhood, than during later times. For he would then, as we may safely conclude, have been guided more by his instinctive passions, and less by foresight or reason. He would not then have been so utterly licentious as many savages now are; and each male would have jealously guarded his wife or wives. He would not then have practised infanticide; nor valued his wives merely as useful slaves; nor have been betrothed to them during infancy. Hence we may infer that the races of men were differentiated, as far as sexual selection is concerned, in chief part during a very remote epoch; and this conclusion throws light on the remarkable fact that at the most ancient period, of which we have as yet obtained any record, the races of man had already come to differ nearly or quite as much as they do at the present day.

The views here advanced, on the part which sexual selection has played in the history of man, want scientific precision. He who does not admit this agency in the case of the lower animals, will properly disregard all that I have written in the later chapters on man. We cannot positively say that this character, but not that, has been thus modified; it has, however, been shown that the races of man differ from each other and from their nearest allies among the lower animals, in certain characters which are of no service to them in their ordinary habits of life, and which it is extremely probable would have been modified through sexual selection. We have seen that with the lowest savages the people of each tribe admire their own characteristic qualities—the shape of the head and face, the squareness of the cheek-bones, the prominence or depression of the nose, the color of the skin, the length of the hair on the head, the absence of hair on the face and body, or the presence of a great beard, etc. Hence these and other such points could hardly fail to have been slowly and gradually exaggerated from the more powerful and able men in each tribe, who would succeed in rearing the largest number of offspring, having selected during many generations as their wives the most strongly-characterized and therefore most attractive women. For my own part I conclude that of all the causes which have led to the differences in external appearance between the races of man, and to a certain extent between man and the lower animals, sexual selection has been by far the most efficient.

CHAPTER XXI.

General Summary and Conclusion.

Main Conclusion that Man is descended from some Lower Form.—Manner of Development.—Genealogy of Man.—Intellectual and Moral Faculties.—Sexual Selection.—Concluding Remarks.

A brief summary will here be sufficient to recall to the reader's mind the more salient points in this work. Many of the views which have been advanced are highly speculative, and some no doubt will prove erroneous; but I have in every case given the reasons which have led me to one view rather than to another. It seemed worth while to try how far the principle of evolution would throw light on some of the more complex problems in the natural history of man. False facts are highly injurious to the progress of science, for they often long endure; but false views, if supported by some evidence, do little harm, as every one takes a salutary pleasure in proving their falseness; and when this is done, one path toward error is closed, and the road to truth is often at the same time opened.

The main conclusion arrived at in this work, and now held by many naturalists who are well competent to form a sound judgment, is that man is descended from some less highly-organized form. The grounds upon which this conclusion rests will never be shaken, for the close similarity between man and the lower animals in embryonic development, as well as in innumerable points of structure and constitution, both of high and of the most trifling importance—the rudiments which he retains, and the abnormal reversions to which he is occasionally liable—are facts which cannot be disputed. They have long been known, but until recently they told us nothing with respect to the origin of man. Now, when viewed by the light of our knowledge of the whole organic world, their meaning is unmistakable. The great principle of evolution stands up clear and firm, when these groups of facts are considered in connection with others, such as the mutual affinities of the members of the same group, their geographical distribution in past and present times, and their geological succession. It is incredible that all these facts should speak falsely. He who is not content to look, like a savage, at the phenomena of Nature as disconnected, cannot any longer believe that man is the work of a separate act of creation. He will be forced to admit that the close resemblance of the embryo of man to that, for instance, of a dog—the construction of his skull, limbs, and whole frame, independently of the uses to which the parts may be put, on the same plan with that of other mammals—the occasional reappearance of various structures, for instance, of several distinct muscles, which man does not normally possess, but which are common to the Quadrumana—and a crowd of analogous facts—all point in the plainest manner to the conclusion that man is the co-descendant with other mammals of a common progenitor.

We have seen that man incessantly presents individual differences in all parts of his body and in his mental faculties. These differences or variations seem to be induced by the same general causes, and to obey the same laws as with the lower animals. In both cases similar laws of inheritance prevail. Man tends to increase at a greater rate than his means of subsistence; consequently he is occasionally subjected to a severe struggle for existence, and natural selection will have effected whatever lies within its scope. A succession of strongly-marked variations of a similar nature are by no means requisite; slight fluctuating differences in the individual suffice for the work of natural selection. We may feel assured that the inherited effects of the long-continued use or disuse of parts will have done much in the same direction with natural selection. Modifications formerly of importance, though no longer of any special use, will be long inherited. When one part is modified, other parts will change through the principle of correlation, of which we have instances in many curious cases of correlated monstrosities. Something may be attributed to the direct and definite action of the surrounding conditions of life, such as abundant food, heat, or moisture; and lastly, many characters of slight physiological importance, some indeed of considerable importance, have been gained through sexual selection.

No doubt man, as well as every other animal, presents structures which, as far as we can judge with our little knowledge, are not now of any service to him, nor have been so during any former period of his existence, either in relation to his general conditions of life, or of one sex to the other. Such structures cannot be accounted for by any form of selection, or by the inherited effects of the use and disuse of parts. We know, however, that many strange and strongly-marked peculiarities of structure occasionally appear in our domesticated productions, and if the unknown causes which produce them were to act more uniformly, they would probably become common to all the individuals of the species. We may hope hereafter to understand something about the causes of such occasional modifications, especially through the study of monstrosities: hence the labors of experimentalists, such as those of M. Camille Dareste, are full of promise for the future. In the greater number of cases, we can only say that the cause of each slight variation and of each monstrosity lies much more in the nature or constitution of the organism, than in the nature of the surrounding conditions; though new and changed conditions certainly play an important part in exciting organic changes of all kinds.

Through the means just specified, aided perhaps by others as yet undiscovered, man has been raised to his present state. But since he attained to the rank of manhood, he has diverged into distinct races, or, as they may be more appropriately called, subspecies. Some of these, for instance, the Negro and European, are so distinct that, if specimens had been brought to a naturalist without any further information, they would undoubtedly have been considered by him as good and true species. Nevertheless all the races agree in so many unimportant details of structure and in so many mental peculiarities, that these can be accounted for only through inheritance from a common progenitor; and a progenitor thus characterized would probably have deserved to rank as man.

It must not be supposed that the divergence of each race from the other races, and of all the races from a common stock, can be traced back to any one pair of progenitors. On the contrary, at every stage in the process of modification, all the individuals which were in any way best fitted for their conditions of life, though in different degrees, would have survived in greater numbers than the less well fitted. The process would have been like that followed by man, when he does not intentionally select particular individuals, but breeds from all the superior and neglects all the inferior individuals. He thus slowly but surely modifies his stock, and unconsciously forms a new strain. So with respect to modifications, acquired independently of selection, and due to variations arising from the nature of the organism and the action of the surrounding conditions, or from changed habits of life, no single pair will have been modified in a much greater degree than the other pairs which inhabit the same country, for all will have been continually blended through free intercrossing.

By considering the embryological structure of man—the homologies which he presents with the lower animals—the rudiments which he retains—and the reversions to which he is liable, we can partly recall in imagination the former condition of our early progenitors; and can approximately place them in their proper position in the zoological series. We thus learn that man is descended from a hairy quadruped, furnished with a tail and pointed ears, probably aboreal in its habits, and an inhabitant of the Old World. This creature, if its whole structure had been examined by a naturalist, would have been classed among the Quadrumana, as surely as would the common and still more ancient progenitor of the Old and New World monkeys. The Quadrumana and all the higher mammals are probably derived from an ancient marsupial animal, and this through a long line of diversified forms, either from some reptile-like or some amphibian-like creature, and this again from some fish-like animal. In the dim obscurity of the past we can see that the early progenitor of all the Vertebrata must have been an aquatic animal, provided with branchiæ, with the two sexes united in the same individual, and with the most important organs of the body (such as the brain and heart) imperfectly developed. This animal seems to have been more like the larvæ of our existing marine Ascidians than any other known form.

The greatest difficulty which presents itself, when we are driven to the above conclusion on the origin of man, is the high standard of intellectual power and of moral disposition which he has attained. But every one who admits the general principle of evolution, must see that the mental powers of the higher animals, which are the same in kind with those of mankind, though so different in degree, are capable of advancement. Thus the interval between the mental powers of one of the higher apes and of a fish, or between those of an ant and scale-insect, is immense. The development of these powers in animals does not offer any special difficulty; for with our domesticated animals, the mental faculties are certainly variable, and the variations are inherited. No one doubts that these faculties are of the utmost importance to animals in a state of nature. Therefore the conditions are favorable for their development through natural selection. The same conclusion may be extended to man; the intellect must have been all-important to him, even at a very remote period, enabling him to use language, to invent and make weapons, tools, traps, etc.; by which means, in combination with his social habits, he long ago became the most dominant of all living creatures.

A great stride in the development of the intellect will have followed, as soon as, through a previous considerable advance, the half-art and half-instinct of language came into use; for the continued use of language will have reacted on the brain, and produced an inherited effect; and this again will have reacted on the improvement of language. The large size of the brain in man, in comparison with that of the lower animals, relatively to the size of their bodies, may be attributed in chief part, as Mr. Chauncey Wright has well remarked,[1] to the early use of some simple form of language—that wonderful engine which affixes signs to all sorts of objects and qualities, and excites trains of thought which would never arise from the mere impression of the senses, and if they did arise could not be followed out. The higher intellectual powers of man, such as those of ratiocination, abstraction, self-consciousness, etc., will have followed from the continued improvement of other mental faculties; but without considerable culture of the mind, both in the race and in the individual, it is doubtful whether these high powers would be exercised, and thus fully attained.

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[1] On the "Limits of Natural Selection," in the 'North American Review,' Oct. 1870, p. 295.

The development of the moral qualities is a more interesting and difficult problem. Their foundation lies in the social instincts, including in this term the family ties. These instincts are of a highly-complex nature, and in the case of the lower animals give special tendencies toward certain definite actions; but the more important elements for us are love, and the distinct emotion of sympathy. Animals endowed with the social instincts take pleasure in each other's company, warn each other of danger, defend and aid each other in many ways. These instincts are not extended to all the individuals of the species, but only to those of the same community. As they are highly beneficial to the species, they have in all probability been acquired through natural selection.

A moral being is one who is capable of comparing his past and future actions and motives—of approving of some and disapproving of others; and the fact that man is the one being who with certainty can be thus designated makes the greatest of all distinctions between him and the lower animals. But in our third chapter I have endeavored to show that the moral sense follows, firstly, from the enduring and always present nature of the social instincts, in which respect man agrees with the lower animals; and secondly, from his mental faculties being highly active and his impressions of past events extremely vivid, in which respects he differs from the lower animals. Owing to this condition of mind, man cannot avoid looking backward and comparing the impressions of past events and actions. He also continually looks forward. Hence after some temporary desire or passion has mastered his social instincts, he will reflect and compare the now weakened impression of such past impulses with the ever-present social instinct; and he will then feel that sense of dissatisfaction which all unsatisfied instincts leave behind them. Consequently he resolves to act differently for the future—and this is conscience. Any instinct which is permanently stronger or more enduring than another, gives rise to a feeling which we express by saying that it ought to be obeyed. A pointer dog, if able to reflect on his past conduct, would say to himself, I ought (as indeed we say of him) to have pointed at that hare, and not have yielded to the passing temptation of hunting it.

Social animals are partly impelled by a wish to aid the members of the same community in a general manner, but more commonly to perform certain definite actions. Man is impelled by the same general wish to aid his fellows, but has few or no special instincts. He differs also from the lower animals in being able to express his desires by words, which thus become the guide to the aid required and bestowed. The motive to give aid is likewise somewhat modified in man: it no longer consists solely of a blind instinctive impulse, but is largely influenced by the praise or blame of his fellow-men. Both the appreciation and the bestowal of praise and blame rest on sympathy; and this emotion, as we have seen, is one of the most important elements of the social instincts. Sympathy, though gained as an instinct, is also much strengthened by exercise or habit. As all men desire their own happiness, praise or blame is bestowed on actions and motives, according as they lead to this end;

and, as happiness is an essential part of the general good, the greatest-happiness principle indirectly serves as a nearly safe standard of right and wrong. As the reasoning powers advance and experience is gained, the more remote effects of certain lines of conduct on the character of the individual, and on the general good, are perceived; and then the self-regarding virtues, from coming within the scope of public opinion, receive praise, and their opposites receive blame. But with the less civilized nations reason often errs, and many bad customs and base superstitions come within the same scope, and consequently are esteemed as high virtues, and their breach as heavy crimes.

The moral faculties are generally esteemed, and with justice, as of higher value than the intellectual powers. But we should always bear in mind that the activity of the mind in vividly recalling past impressions is one of the fundamental though secondary bases of conscience. This fact affords the strongest argument for educating and stimulating in all possible ways the intellectual faculties of every human being. No doubt a man with a torpid mind, if his social affections and sympathies are well developed, will be led to good actions, and may have a fairly sensitive conscience. But whatever renders the imagination of men more vivid and strengthens the habit of recalling and comparing past impressions, will make the conscience more sensitive, and may even compensate to a certain extent for weak social affections and sympathies.

The moral nature of man has reached the highest standard as yet attained, partly through the advancement of the reasoning powers and consequently of a just public opinion, but especially through the sympathies being rendered more tender and widely diffused through the effects of habit, example, instruction, and reflection

It is not improbable that virtuous tendencies may through long practice be inherited. With the more civilized races, the conviction of the existence of an all-seeing Deity has had a potent influence on the advancement of morality. Ultimately man no longer accepts the praise or blame of his fellows as his chief guide, though few escape this influence, but his habitual convictions controlled by reason afford him the safest rule. His conscience then becomes his supreme judge and monitor. Nevertheless the first foundation or origin of the moral sense lies in the social instincts, including sympathy; and these instincts no doubt were primarily gained, as in the case of the lower animals, through natural selection.

The belief in God has often been advanced as not only the greatest, but the most complete, of all the distinctions between man and the lower animals. It is, however, impossible, as we have seen, to maintain that this belief is innate or instinctive in man. On the other hand, a belief in all-pervading spiritual agencies seems to be universal; and apparently follows from a considerable advance in the reasoning powers of man, and from a still greater advance in his faculties of imagination, curiosity, and wonder. I am aware that the assumed instinctive belief in God has been used by many persons as an argument for His existence. But this is a rash argument, as we should thus be compelled to believe in the existence of many cruel and malignant spirits, possessing only a little more power than man; for the belief in them is far more general than of a beneficent Deity. The idea of a universal and beneficent Creator of the universe does not seem to arise in the mind of man, until he has been elevated by long-continued culture.

He who believes in the advancement of man from some lowly-organized form, will naturally ask, "How does this bear on the belief in the immortality of the soul?" The barbarous races of man, as Sir J. Lubbock has shown, possess no clear belief of this kind; but arguments derived from the primeval beliefs of savages are, as we have just seen, of little or no avail. Few persons feel any anxiety from the impossibility of determining at what precise period in the development of the individual, from the first trace of the minute germinal vesicle to the child either before or after birth, man becomes an immortal being; and there is no greater cause for anxiety because the period in the gradually-ascending organic scale cannot possibly be determined.[2]

I am aware that the conclusions arrived at in this work will be denounced by some as highly irreligious; but he who thus denounces them is bound to show why it is more irreligious to explain the origin of man as a distinct species by descent from some lower form, through the laws of variation and natural selection, than to explain the birth of the individual through the laws of ordinary reproduction. The birth both of the species and of the individual are equally parts of that grand sequence of events, which our minds refuse to accept as the result of blind chance. The understanding revolts at such a conclusion, whether or not we are able to believe that every slight variation of structure, the union of each pair in marriage, the dissemination of each seed, and other such events, have all been ordained for some special purpose.

Sexual selection has been treated at great length in these volumes; for, as I have attempted to show, it has played an important part in the history of the organic world. As summaries have been given to each chapter, it would be superfluous here to add a detailed summary.

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[2] The Rev. J. A. Picton gives a discussion to this effect in his 'New Theories and the Old Faith,' 1870.

I am aware that much remains doubtful, but I have endeavored to give a fair view of the whole case. In the lower divisions of the animal kingdom, sexual selection seems to have done nothing: such animals are often affixed for life to the same spot, or have the two sexes combined in the same individual, or, what is still more important, their perceptive and intellectual faculties are not sufficiently advanced to allow of the feelings of love and jealousy, or of the exertion of choice. When, however, we come to the Arthropoda and Vertebrata, even to the lowest classes in these two great sub-kingdoms, sexual selection has effected much; and it deserves notice that we here find the intellectual faculties developed, but in two very distinct lines, to the highest standard, namely, in the Hymenoptera (ants, bees, etc.) among the Arthropoda, and in the Mammalia, including man, among the Vertebrata.

In the most distinct classes of the animal kingdom, with mammals, birds, reptiles, fishes, insects, and even crustaceans, the differences between the sexes follow almost exactly the same rules. The males are almost always the wooers; and they alone are armed with special weapons for fighting with their rivals. They are generally stronger and larger than the females, and are endowed with the requisite qualities of courage and pugnacity. They are provided, either exclusively or in a much higher degree than the females, with organs for producing vocal or instrumental music, and with odoriferous glands. They are ornamented with infinitely-diversified appendages, and with the most brilliant or conspicuous colors, often arranged in elegant patterns, while the females are left unadorned. When the sexes differ in more important structures, it is the male which is provided with special sense-organs for discovering the female, with locomotive organs for reaching her, and often with prehensile organs for holding her. These various structures for securing or charming the female are often developed in the male during only part of the year, namely, the breeding-season. They have in many cases been transferred in a greater or less degree to the females; and in the latter case they appear in her as mere rudiments. They are lost by the males after emasculation. Generally they are not developed in the male during early youth, but appear a short time before the age for reproduction. Hence in most cases the young of both sexes resemble each other, and the female resembles her young offspring throughout life. In almost every great class a few anomalous cases occur in which there has been an almost complete transposition of the characters proper to the two sexes; the females assuming characters which properly belong to the males. This surprising uniformity in the laws regulating the differences between the sexes in so many and such widely-separated classes, is intelligible if we admit the action throughout all the higher divisions of the animal kingdom of one common cause, namely, sexual selection.

Sexual selection depends on the success of certain individuals over others of the same sex in relation to the propagation of the species; while natural selection depends on the success of both sexes, at all ages, in relation to the general conditions of life. The sexual struggle is of two kinds; in the one it is between the individuals of the same sex, generally the male sex, in order to drive away or kill their rivals, the females remaining passive; while, in the other, the struggle is likewise between the individuals of the same sex, in order to excite or charm those of the opposite sex, generally the females, which no longer remain passive, but select the more agreeable partners. This latter kind of selection is closely analogous to that which man unintentionally, yet effectually, brings to bear on his domesticated productions, when he continues for a long time choosing the most pleasing or useful individuals, without any wish to modify the breed.

The laws of inheritance determine whether characters gained through sexual selection by either sex shall be transmitted to the same sex, or to both sexes; as well as the age at which they shall be developed. It appears that variations which arise late in life are commonly transmitted to one and the same sex. Variability is the necessary basis for the action of selection, and is wholly independent of it. It follows from this, that variations of the same general nature have often been taken advantage of and accumulated through sexual selection in relation to the propagation of the species, and through natural selection in relation to the general purposes of life. Hence secondary sexual characters, when equally transmitted to both sexes, can be distinguished from ordinary specific characters only by the light of analogy. The modifications acquired through sexual selection are often so strongly pronounced that the two sexes have frequently been ranked as distinct species, or even as distinct genera. Such strongly-marked differences must be in some manner highly important; and we know that they have been acquired in some instances at the cost not only of inconvenience, but of exposure to actual danger.

The belief in the power of sexual selection rests chiefly on the following considerations: The characters which we have the best reason for supposing to have been thus acquired are confined to one sex; and this alone renders it probable that they are in some way connected with the act of reproduction. These characters in innumerable instances are fully developed only at maturity; and often during only a part of the year, which is always the breeding-season. The males (passing over a few exceptional cases) are the most active in courtship; they are the best armed, and are rendered the most attractive in various ways. It is to be especially observed that the males display their attractions with elaborate care in the presence of the females; and that they rarely or never display them excepting during the season of love. It is incredible that all this display should be purposeless. Lastly, we have distinct evidence with some quadrupeds and birds that the individuals of the one sex are capable of feeling a strong antipathy or preference for certain individuals of the opposite sex.

Bearing these facts in mind, and not forgetting the marked results of man's unconscious selection, it seems to me almost certain that if the individuals of one sex were during a long series of generations to prefer pairing with certain individuals of the other sex, characterized in some peculiar manner, the offspring would slowly but surely become modified in this same manner. I have not attempted to conceal that, excepting when the males are more numerous than the females, or when polygamy prevails, it is doubtful how the more attractive males succeed in leaving a larger number of offspring to inherit their superiority in ornaments or other charms than the less attractive males; but I have shown that this would probably follow from the females—especially the more vigorous females, which would be the first to breed—preferring not only the more attractive but at the same time the more vigorous and victorious males.

Although we have some positive evidence that birds appreciate bright and beautiful objects, as with the Bower-birds of Australia, and although they certainly appreciate the power of song, yet I fully admit that it is an astonishing fact that the females of many birds and some mammals should be endowed with sufficient taste for what has apparently been effected through sexual selection; and this is even more astonishing in the case of reptiles, fish, and insects. But we really know very little about the minds of the lower animals. It cannot be supposed that male Birds of Paradise or Peacocks, for instance, should take so much pains in erecting, spreading, and vibrating their beautiful plumes before the females for no purpose. We should remember the fact given on excellent authority in a former chapter, namely, that several peahens, when debarred from an admired male, remained widows during a whole season rather than pair with another bird.

Nevertheless, I know of no fact in natural history more wonderful than that the female Argus pheasant should be able to appreciate the exquisite shading of the ball-and-socket ornaments and the elegant patterns on the wing-feathers of the male. He who thinks that the male was created as he now exists must admit that the great plumes, which prevent the wings from being used for flight, and which, as well as the primary feathers, are displayed in a manner quite peculiar to this one species during the act of courtship, and at no other time, were given to him as an ornament. If so, he must likewise admit that the female was created and endowed with the capacity of appreciating such ornaments. I differ only in the conviction that the male Argus pheasant acquired his beauty gradually, through the females having preferred during many generations the more highly-ornamented males; the æsthetic capacity of the females having been advanced through exercise or habit in the same manner as our own taste is gradually improved. In the male, through the fortunate chance of a few feathers not having been modified, we can distinctly see how simple spots with a little fulvous shading on one side might have been developed by small and graduated steps into the wonderful ball-and-socket ornaments; and it is probable that they were actually thus developed.

Every one who admits the principle of evolution, and yet feels great difficulty in admitting that female mammals, birds, reptiles, and fish, could have acquired the high standard of taste which is implied by the beauty of the males, and which generally coincides with our own standard, should reflect that in each member of the vertebrate series the nerve-cells of the brain are the direct offshoots of those possessed by the common progenitor of the whole group. It thus becomes intelligible that the brain and mental faculties should be capable under similar conditions of nearly the same course of development, and consequently of performing nearly the same functions.

The reader who has taken the trouble to go through the several chapters devoted to sexual selection will be able to judge how far the conclusions at which I have arrived are supported by sufficient evidence. If he accepts these conclusions, he may, I think, safely extend them to mankind; but it would be superfluous here to repeat what I have so lately said on the manner in which sexual selection has apparently acted on both the male and female side, causing the two sexes of man to differ in body and mind, and the several races to differ from each other in various characters, as well as from their ancient and lowly-organized progenitors.

He who admits the principle of sexual selection will be led to the remarkable conclusion that the cerebral system not only regulates most of the existing functions of the body, but has indirectly influenced the progressive development of various bodily structures and of certain mental qualities. Courage, pugnacity, perseverance, strength and size of body, weapons of all kinds, musical organs, both vocal and instrumental, bright colors, stripes and marks, and ornamental appendages, have all been indirectly gained by the one sex or the other through the influence of love and jealousy, through the appreciation of the beautiful in sound, color, or form, and through the exertion of a choice; and these powers of the mind manifestly depend on the development of the cerebral system.

. . . .

Man scans with scrupulous care the character and pedigree of his horses, cattle, and dogs, before he matches them ; but when he comes to his own marriage he rarely, or never, takes any such care. He is impelled by nearly the same motives as are the lower animals when left to their own free choice, though he is in so far superior to them that he highly values mental charms and virtues. On the other hand, he is strongly attracted by mere wealth or rank. Yet he might by selection do something not only for the bodily constitution and frame of his offspring, but for their intellectual and moral qualities. Both sexes ought to refrain from marriage if in any marked degree inferior in body or mind ; but such hopes are Utopian and will never be even partially realized until the laws of inheritance are thoroughly known. All do good service who aid toward this end. When the principles of breeding and of inheritance are better understood, we shall not hear ignorant members of our legislature rejecting with scorn a plan for ascertaining by an easy method whether or not consanguineous marriages are injurious to man.

The advancement of the welfare of mankind is a most intricate problem : all ought to refrain from marriage who cannot avoid abject poverty for their children ; for poverty is not only a great evil, but tends to its own increase by leading to recklessness in marriage. On the other hand, as Mr. Galton has remarked, if the prudent avoid marriage, while the reckless marry, the inferior members will tend to supplant the better members of society. Man, like every other animal, has no doubt advanced to his present high condition through a struggle for existence consequent on his rapid multiplication ; and if he is to advance still higher he must remain subject to a severe struggle. Otherwise he would soon sink into indolence, and the more highly-gifted men would not be more successful in the battle of life than the less gifted. Hence our natural rate of increase, though leading to many and obvious evils, must not be greatly diminished by any means. There should be open competition for all men; and the most able should not be prevented by laws or customs from succeeding best and rearing the largest number of offspring. Important as the struggle for existence has been and even still is, yet as far as the highest part of man's nature is concerned there are other agencies more important. For the moral qualities are advanced, either directly or indirectly, much more through the effects of habit, the reasoning powers, instruction, religion, etc., than through natural selection; though to this latter agency the social instincts, which afforded the basis for the development of the moral sense, may be safely attributed.

The main conclusion arrived at in this work, namely, that man is descended from some lowly-organized form, will, I regret to think, be highly distasteful to many persons. But there can hardly be a doubt that we are descended from barbarians. The astonishment which I felt on first seeing a party of Fuegians on a wild and broken shore will never be forgotten by me, for the reflection at once rushed into my mind — such were our ancestors. These men were absolutely naked and bedaubed with paint, their long hair was tangled, their mouths frothed with excitement, and their expression was wild, startled, and distrustful. They possessed hardly any arts, and, like wild animals, lived on what they could catch; they had no government, and were merciless to every one not of their own small tribe. He who has seen a savage in his native land will not feel much shame, if forced to acknowledge that the blood of some more humble creature flows in his veins. For my own part, I would as soon be descended from that heroic little monkey, who braved his dreaded enemy in order to save the life of his keeper; or from that old baboon, who, descending from the mountains, carried away in triumph his young comrade from a crowd of astonished dogs—as from a savage who delights to torture his enemies, offers up bloody sacrifices, practises infanticide without remorse, treats his wives like slaves, knows no decency, and is haunted by the grossest superstitions.

Man may be excused for feeling some pride at having risen, though not through his own exertions, to the very summit of the organic scale; and the fact of his having thus risen, instead of having been aboriginally placed there, may give him hopes for a still higher destiny in the distant future. But we are not here concerned with hopes or fears, only with the truth as far as our reason allows us to discover it. I have given the evidence to the best of my ability; and we must acknowledge, as it seems to me, that man with all his noble qualities, with sympathy which feels for the most debased, with benevolence which extends not only to other men but to the humblest living creature, with his godlike intellect which has penetrated into the movements and constitution of the solar system—with all these exalted powers—Man still bears in his bodily frame the indelible stamp of his lowly origin.

INDEX.

A.

Abbott, C., on the battles of seals, ii. 229.

Abductor of the fifth metatarsal, presence of, in man, i. 123.

Abercrombie, Dr., on disease of the brain affecting speech, i. 56.

Abipones, marriage-customs of the, ii. 356.

Abou-Simbel, caves of, i. 209.

Abortion, prevalence of the practice of, i. 129.

Abstraction, i. 60.

Acalles, stridulation of, i. 372.

Acanthodactylus capensis, sexual differences of color in, ii. 34.

Accentor modularis, ii. 189.

Acclimatization, difference of, in different races of men, i. 209.

Achetidæ, stridulation of the, i. 341, 342, 348; rudimentary stridulating organs in female, i. 348.

Acilius sulcatus, elytra of the female, i. 333.

Acomus, development of spurs in the female of, ii. 154.

Acridiidæ, stridulation of the, i. 342, 345; rudimentary stridulating organs in female, i. 348.

Acting, i. 224.

Actiniæ, bright colors of, i. 313.

Admiral butterfly, i. 380.

Adoption of the young of other animals by female monkeys, i. 39.

Advancement in the organic scale, Von Baer's definition of, i. 203.

Aeby, on the difference between the skulls of man and the quadrumana, i. 183.

Æsthetic faculty, not highly developed in savages, i. 62.

Affection, maternal, i. 39; manifestation of, by animals, i. 39; parental and filial, partly the result of natural selection, i. 77; shown by birds in confinement, for certain persons, ii. 105; mutual, of birds, ii. 104.

Africa, probably the birthplace of man, i. 191; South, crossed population of, i. 217, South, retention of color by the Dutch in, i. 233; South, proportion of the sexes in the butterflies of, i. 301; tattooing practised in, ii. 323; Northern, coiffure of natives of, ii. 324.

Agassiz, L., on conscience in dogs, i. 75; on the coincidence of the races, of man with zoological provinces, i. 210; on the number of species of man, i. 218; on the courtship of the land-snails, i. 315; on the brightness of the colors of male fishes during the breeding-season, ii. 12; on the frontal protuberance of the males, of *Geophagus* and *Cichla*, ii. 13, 26; on the slight sexual differences of the South Americans, ii. 308; on the tattooing of the Amazonian Indians, ii. 326.

Age, in relation to the transmission of characters in birds, ii. 175; variation in accordance with, in birds, ii. 203.

Agelæus Phœniceus, ii. 111.

Ageronia feronia, noise produced by, i. 375.

Agrion, dimorphism in, i. 352.

Agrion Ramburii, sexes of, i. 351.

Agrionidæ, difference in the sexes of, i. 361.

Agrotis exclamationis, i. 358.

Ague, tertian, dog suffering from, i. 12.

Aïthurus polytmus, young of, ii, 211.

Aionos, hairiness of the, ii. 306.

Alca torda, young of, ii. 208.

Alces palmata, ii. 247.

Alder and Hancock, MM., on the nudibranch mollusca, i. 317.

Algen, Mr., on the stridulation of *Scolytus*, i. 368.

Allen, J. A., on the relative size of the sexes of *Callorhinus ursinus*, ii. 248; on the mane of *Otaria jubata*, ii. 255; on the pairing of seals, ii. 257; on sexual differences in the color of bats, ii. 273.

Allen, S., on the habits of *Hoplopterus*, ii. 46; on the plumes of herons, ii. 79; on the vernal moult of *Herodias, bubulcus*, ii. 80.

Alligator, courtship of the male, i. 264, ii. 27; roaring of the male, i. 322.

AMADAVAT, pugnacity of male, ii. 46.
Amadina Lathami, display of plumage by the male, ii. 91.
Amadina castanotis, display of plumage by the male, ii. 91.
AMAZONS, butterflies of the, i. 301; fishes of the, ii. 17.
AMERICA, variation in the skulls of aborigines of, i. 104; wide range of aborigines of, i. 211; lice of the natives of, i. 212; general beardlessness of the natives of, ii. 307.
AMERICA, North, butterflies of, i. 301; Indians of, women a cause of strife among the, ii. 308; Indians of, their notions of female beauty, ii. 327, 328.
AMERICA, South, character of the natives of, i. 208; population of parts of, i. 216; piles of stones in, i. 224; extinction of the fossil horse of, i. 231; desert-birds of, ii. 214; slight sexual difference of the aborigines of, ii. 367; prevalence of infanticide in, ii. 347.
AMERICAN languages, often highly artificial, i. 108.
AMERICANS, wide geographical range of, i. 108; and negroes, difference of, i. 238; aversion of, to hair on the face, ii. 219; native, variability of, i. 219.
Ammophila, on the jaws of, i. 232.
Ammotragus tragelaphus, hairy forelegs of, ii. 269, 272.
AMPHIBIA, affinity of, to the ganoid fishes, i. 196; vocal organs of the, ii. 315.
AMPHIBIANS, i. 204, ii. 22; breeding while immature, ii. 206.
Amphioxus, i. 196.
AMPHIPODA, males sexually mature while young, ii. 205.
AMUNOPH III., negro character of features of, i. 210.
ANAL appendages of insects, i. 332.
ANALOGOUS variation in the plumage of birds, ii. 71.
Anas, ii. 172.
Anas acuta, male plumage of, ii. 81.
Anas boschas, male plumage of, ii. 81.
Anas histrionica, ii. 205.
Anastomus oscitans, sexes and young of, ii. 208; white nuptial plumage of, ii. 218.
ANATIDÆ, voices of, ii, 57.
Anax junius, difference in the sexes of, i. 351.
ANGLO-SAXONS, estimation of the beard among the, ii. 333.
ANIMALS, cruelty of savages to, i. 91; domesticated, more fertile than wild, i. 127; characters common to man and, i. 178; domestic, change of breeds of, ii. 353.
ANNELIDA, i. 318.
ANNULOSA, i. 318.
Anolis cristatellus, male, crest of, ii. 30; pugnacity of the male, ii. 30; throat-pouch of, ii. 31.
Anobium tessellatum, sounds produced by, i. 373.
Anser Canadensis, ii. 112.
Anser cygnoides, ii. 110; knob at the base of the beak of, ii. 124.
Anser hyperboreus, whiteness of, ii. 218.
ANTELOPE, prong-horned, horns of, i. 279.
ANTELOPES, generally polygamous, i. 258; horns of, i. 279, ii. 234; canine teeth of some male, ii. 230; use of horns of, ii. 259; dorsal crests in, ii. 268; dewlaps of, ii. 270; winter change of two species of, ii. 284; peculiar markings of, ii. 285,
ANTENNÆ, furnished with cushions in the male of *Penthe*, i. 333.
Anthidium manicatum, large male of, i. 337.
Anthocharis cardamines, i. 376, 381; sexual difference of color in, i. 396.
Anthocharis genutia, i. 381
Anthocharis sara, i. 381.
Anthophora acervorum, large male of, i. 337.
Anthophora retusa, difference of the sexes in, i. 354.
Anthus, moulting of, ii. 79.
ANTHROPIDÆ, i. 187.
ANTIGUA, Dr. Nicholson's observations on yellow fever in, i. 236.
ANTICS of birds, ii. 65.
Antilocapra Americana, horns of, i, 280, ii. 234.
Antilope bezoartica, horned females of, ii. 235, 237; sexual difference in the color of, ii. 274.
Antilope Dorcas and *euchore*, ii. 234.
Antilope euchore, horns of, ii. 239.
Antilope montana, rudimentary canines in the young male of, ii. 246.
Antilope niger, *sing-sing*, *caama*, and *gorgon*, sexual differences in the colors of, ii. 275.
Antilope oreas, horns of, i. 279.
Antilope saiga, polygamous habits of, i. 258.
Antilope strepsiceros, horns of, i. 279.
Antilope subgutturosa, absence of suborbital pits in, ii. 267.
ANTIPATHY, shown by birds in confinement, to certain persons, ii. 106.
ANTS, i. 179; playing together, i. 38; memory in, i. 44; intercommunication of, by means of the antennæ, i. 56; large size of the cerebral ganglia in, i. 140; soldier-, large jaws of, i. 149; difference of the sexes in, i. 354; recognition of each other by, after separation, i. 354.
ANTS, White, habits of, i. 353.
ANURA, ii. 24.
Apatania muliebris, male unknown, i. 306.
Apathus, difference of the sexes in, i. 355
Apatura Iris, i. 374, 376.
APES, anthropomorphous, i. 189; difference of the young, from the adult, i. 13; building platforms, i. 51; probable speedy extermination of the, i. 193; Gratiolet on the evolution of, i. 222; semi-erect attitude of some, i. 137; mastoid processes of, i. 137; influence of the jaw-muscles on the physiognomy of, i. 139

female, destitute of large canines, i. 150; imitative faculties of, i. 155; canine teeth of male, ii. 230; females of some, less hairy beneath than the males, ii. 361.
APES. long-armed, their mode of progression, i. 137.
Apis mellifica, large male of. i. 337.
APOLLO, Greek statues of, ii. 333.
APOPLEXY in *Cebus Azaræ*, i. 12.
APPROBATION, influence of the love of, i. 82, 88, 157, 158.
APPENDAGES, anal, of insects, i. 332.
prosmictus scapulatus, ii. 166.
AQUATIC birds, frequency of white plumage in, ii. 219.
Aquila chrysaëtos, ii. 100.
ARAB women, elaborate and peculiar coiffure of, ii. 336.
ARABS, gashing of cheeks and temples among the, ii. 323.
ARACHNIDA, i. 321.
ARAKHAN, artificial widening of the forehead by the natives of, ii. 335.
Arboricola, young of, ii. 182.
Archeopteryx, i. 196.
ARCTIIDÆ, coloration of the, i. 383.
Ardea asha, *rufescens*, and *cærulea*, change of color in, ii. 221, 222.
Ardea cærulea, breeding in immature plumage, ii. 205.
Ardea gularis, change of plumage in, ii. 222.
Ardea herodias, love-gestures of the male, ii. 65.
Ardea ludoviciana, age of mature plumage in, ii. 204; continued growth of crest and plumes in the male of, ii. 207.
Ardea nycticorax, cries of, ii. 48.
Ardeola, young of, ii. 182.
Ardetta, changes of plumage in, ii. 170.
ARGENTEUIL, i. 28.
ARGUS pheasant, ii. 69, 93, 173; display of plumage by the male, ii. 89; ocellated spots of the, ii. 128, 135; gradation of characters in the, ii. 135.
ARGYLL, Duke of, the fashioning of implements peculiar to man, i. 50; on the contest in man between right and wrong, i. 100; on the physical weakness of man, i. 149; on the primitive civilization of man, i. 174; on the plumage of the male Argus pheasant, ii. 89; on *Urosticte Benjamini*, ii. 145; on the nests of birds, ii. 159; on variety as an object in nature, ii. 220.
Argynnis aglaia, coloring of the lower surface of, i. 384.
Aricoris epitus, sexual differences in the wings of i. 335.
ARISTOCRACY, increased beauty of the, ii. 340.
ARMS, proportions of, in soldiers and sailors, i. 112; direction of the hair on the, i. 185.
ARMS and hands, free use of, indirectly correlated with diminution of canines, i. 138.
ARREST of development, i. 117.
ARROW-HEADS, stone, general resemblance of, i. 224.
ARROWS, use of, i. 224.
ARTERIES, variations in the course of the, i. 104.
ARTERY, effect of tying, upon the lateral channels, i. 112.
ARTHROPODA, i. 318.
ARTS practised by savages, i. 225.
ASCENSION, colored incrustation on the rocks of, i. 317.
ASCIDIA, affinity of the lancelet to, i. 196; tadpole-like larvæ of, i. 197.
ASCIDIANS, i. 315; bright colors of some, i. 313.
Asinus, Asiatic and African species of, ii. 291.
Asinus tæniopus, ii. 291.
ASS, color-variations of the, ii. 291.
Ateles, effects of brandy on an, i. 12; absence of the thumb in, i. 135.
Ateles beelzebuth, ears of, i. 22.
Ateles marginatus, color of the ruff of, ii. 278; hair on the head of, ii. 105; on the recognition of a dog by a turkey, ii. 106; on the selection of a mate by female birds, ii. 199.
Ateuchus, stridulation of, i. 372.
Ateuchus cicatricosus, habits of, i. 365.
Athalia, proportions of the sexes in, i. 305.
ATTENTION, manifestations of, in animals, i. 43.
AUDOUIN, V., on a hymenopterous parasite with a sedentary male, i. 264.
AUDUBON, J. J., on the pugnacity of male birds, ii. 41, 46; on *Tetrao cupido*, ii. 47; on *Ardea nycticorax*, ii. 48; on *Sturnella ludoviciana*, ii. 48; on the vocal organs of *Tetrao cupido*, ii. 53; on the drumming of the male *Tetrao umbellus*, ii. 59; on sounds produced by the nightjar, ii. 61; on *Ardea herodias* and *Cathartes jota*, ii. 65; on the spring change of color in some finches, ii. 83; on *Mimus polyglottus*, ii. 112; on the turkey, ii. 114, 116; on variation in the male scarlet tanager, ii. 121; on the habits of *Pyranga æstiva*, ii. 159; on local differences in the nests of the same species of birds, ii. 163; on the habits of woodpeckers, ii. 167; on *Bombycilla Carolinensis*, ii. 172; on young females of *Tanagra æstiva* acquiring male characters, ii. 172; on the immature plumage of thrushes, ii. 177; on the immature plumage of birds, ii. 178, *et seq.*; on birds breeding in immature plumage, ii. 205; on the growth of the crest and plumes in the male *Ardea ludoviciana*, ii. 206; on the change of color in some species of *Ardea*, ii. 221; on the speculum of *Mergus cucullatus*, ii. 277; on the musk-rat, ii. 284.
AUDUBON and Bachman, MM., on squirrels fighting, ii. 228; on the Canadian lynx, ii. 255.
AUSTEN, N. L., on *Anolis cristatellus*, ii. 31.
AUSTRALIA, half-castes killed by the natives of, i. 212; lice of the natives of, i.

212; not the birthplace of man, i. 191; prevalence of female infanticide in, ii. 348.

Australia, South, variation in the skulls of aborigines of, i. 104.

Australians, color of new-born children of, ii. 303; relative height of the sexes of, ii. 305; women a cause of war among the, ii. 308.

Axis deer, sexual difference in the color of the, ii. 276.

Aymaras, measurements of the, i. 115; no gray hair among the. ii. 304; hairlessness of the face in the, ii. 307; long hair of the, ii. 331.

Azara, on the proportion of men and women among the Guaranys, i. 302; on *Palamedea cornuta*, ii. 44; on the beards of the Guaranys, ii. 307; on strife for women among the Guanas, ii. 309; on infanticide, ii. 328, 347; on the eradication of the eyebrows and eyelashes by the Indians of Paraguay, ii. 332; on polyandry among the Guanas, ii. 349; celibacy unknown among the savages of South America. ii. 350; on the freedom of divorce among the Charruas, ii. 356.

B.

Babbage, C., on the greater proportion of illegitimate female births, i. 292.

Babirusa, tusks of the, ii. 252.

Baboon, employing a mat for shelter against the sun, i. 51; manifestation of memory by a, i. 43; protected from punishment by its companions, i. 74; rage excited in, by reading, i. 41.

Baboon, Cape, mane of the male, ii. 255; Hamadryas, mane of the male, ii. 255.

Baboons, effects of intoxicating liquors on, i. 12; ears of, i. 22; manifestation of maternal affection by, i. 38; using stones and sticks as weapons, i. 50; coöperation of, i. 72; silence of, on plundering expeditions, i. 75; diversity of the mental faculties in, i. 106; hands of, i. 134; habits of, i. 136; variability of the tail in, i. 144; apparent polygamy of, i. 258; polygamous and social habits of, ii. 345, 346.

Bachman, Dr., on the fertility of mulattoes, i. 213.

Baer, K. E., von, on embryonic development, i. 14.

Bagehot, W., on the social virtues among primitive men, i. 89; on the value of obedience, i. 156; on human progress, i. 160; on the persistence of savage tribes in classical times, i. 230.

Bailly, E. M., on the fighting of stags, ii. 241; on the mode of fighting of the Italian buffalo, ii. 239.

Bain, A., on the sense of duty, i. 68; aid springing from sympathy, i. 74; on the bases of sympathy, i. 78; on love of approbation, etc., i. 82; on the idea of beauty, ii. 337.

Baird, W., on a difference in color between the males and females of some Entozoa, i. 312.

Baker, Mr., observation on the proportion of the sexes in pheasant-chicks, i. 297.

Baker, Sir S., on the fondness of the Arabs for discordant music, ii. 64; on sexual difference in the colors of an antelope, ii. 275; on the elephant and rhinoceros attacking white or gray horses, ii. 281; on the disfigurements practised by the negroes, ii. 282; on the gashing of the cheeks and temples practised in Arab countries, ii. 323; on the coiffure of the North Africans, ii. 324; on the perfora- of the lower lip by the women of Latooka, ii. 325; on the distinctive characters of the coiffure of central African tribes, ii. 326; on the coiffure of Arab women, ii. 336.

"Balz" of the Black-cock, ii. 43, 96.

Bantam, Sebright, i. 250, 285.

Banteng, horns of, ii. 236; sexual differences in the colors of the, ii. 275.

Banyai, color of the, ii. 330.

Barbarism, primitive, of civilized nations, i. 174.

Barbs, filamentous, of the feathers, in certain birds, ii. 70.

Barr, Mr., on sexual preference in dogs, ii. 259.

Barrington, Daines, on the language of birds, i. 53; on the clucking of the hen, ii. 49; on the object of the song of birds, ii. 50; on the singing of female birds, ii. 51; on birds acquiring the songs of other birds, ii. 52; on the muscles of the larynx in song-birds, ii. 53; on the want of the power of song by female birds, ii. 156.

Barrow, on the widow-bird, ii. 93.

Bartlett, A. D., on the tragopan, i. 261; on the development of the spurs, in *Crossoptilon auritum*, i. 280; on the fighting of the males of *Plectropterus gambensis*, ii. 44; on the knot, ii. 78; on display in male birds, ii. 83; on the display of plumage by the male *Polyplectron*, ii. 85; on *Crossoptilon auritum* and *Phasianus Wallichii*, ii. 89; on the habits of *Lophophorus*, ii. 116; on the color of the mouth in *Buceros bicornis*, ii. 123; on the incubation of the cassowary, ii. 195; on the Cape Buffalo, ii. 239; on the use of the horns of antelopes, ii. 240; on the fighting of male wart-hogs, ii. 254; on *Ammotragus tragelaphus*, ii. 269; on the colors of *Cercopithecus cephus*, ii. 277; on the colors of the faces of monkeys, ii. 295; on the naked surfaces of monkeys, ii. 300.

Bartram, on the courtship of the male alligator, ii. 27.

Basque language, highly artificial, i. 59.

Bate, C. S., on the superior activity of male crustacea, i. 263; on the proportions of the sexes in crabs, i. 307; on the chelæ of crustacea, i. 320; on the relative size of the sexes in crustacea, i. 323; on the colors of crustacea, i. 326.

Bates, H. W., on variation in the form of the head of Amazonian Indians, i. 107; on the proportion of the sexes among Amazonian butterflies, i. 301; on sexual differences in the wings of butterflies, i. 335: on the field-cricket, i. 342; on *Pyrodes pulcherrimus*, i. 356; on the horns of Lamellicorn beetles, i. 359, 360; on the colors of *Epicaliæ*, etc., i. 376; on the coloration of tropical butterflies, i. 379; on the variability of *Papilio Sesostris* and *Childrenæ*, i. 390; on male and female butterflies inhabiting different stations, i. 390; on mimickry, i. 398; on the caterpillar of a *Sphinx*, i. 402; on the vocal organs of the umbrella-bird, ii. 56; on the toucans, ii. 217; on *Brachyurus calvus*, ii. 295.

Batokas, knocking out two upper incisors, ii. 324.

Batrachia, ii. 24; eagerness of male, i. 263.

Bats, sexual differences in the color of, ii. 272.

Battle, law of, i. 175; among beetles, i. 363; among birds, ii. 38; among mammals, ii. 229, *et seq.;* in man, ii. 308.

Beak, sexual difference in the forms of the, ii. 37; in the color of the, ii. 69.

Beaks, of birds, bright colors of, ii. 217.

Beard, development of, in man, ii. 302; analogy of the, in man and the quadrumana, ii. 304; variation of the development of the, in different races of men, ii. 306; estimation of, among bearded nations, ii. 333; probable origin of the, ii. 356.

Beards, in monkeys, i. 184; of mammals, ii. 269.

Beautiful, taste for the, in birds, ii. 103; in the quadrumana, ii. 282.

Beauty, sense of, in animals, i. 61; appreciation of, by birds, ii. 107; influence of, ii. 322, 327; variability of the standard of, ii. 353.

Beavan, Lieut., on the development of the horns in *Cervus Eldi*, i. 279.

Beaver, instinct and intelligence of the, i. 36, 37; voice of the, ii. 264; castoreum of the, ii. 266.

Beavers, battles of male, ii. 228.

Bechstein, on female birds choosing the best singers among the males, ii. 49; on rivalry in song-birds, ii. 50; on the singing of female birds, ii. 51; on birds acquiring the songs of other birds, ii. 52; on pairing the canary and siskin, ii. 110; on a subvariety of the monk pigeon, ii. 126; on spurred hens, ii. 154.

Beddoe, Dr., on causes of difference in stature, i. 111.

Bee-eater, ii. 53.

Bees, i. 70; destruction of drones and queens by, i. 77; pollen-baskets and stings of, i. 149; female, secondary sexual characters of, i. 246; difference of the sexes in, i. 354.

Beetle, luminous larva of a, i. 335.

Beetles, i. 355; size of the cerebral ganglia in, i. 140; dilatation of the fore tarsi in male, i. 333; blind, i. 356; stridulation of, i. 366.

Belgium, ancient inhabitants of, i. 228.

Bell, Sir C., on emotional muscles in man, i. 5; "snarling muscles," i. 122; on the hand, i. 136.

Bell, T., on the numerical porportion of the sexes in moles, i. 296; on the newts, ii. 23; on the croaking of the frog, ii. 25; on the difference in the coloration of the sexes in *Zootoca vivipara*, ii. 35; on moles fighting, ii. 228.

Bell-bird, sexual difference in the color of the, ii. 75.

Bell-birds, colors of, ii. 218.

Benevolence, manifested by birds, ii 104.

Bennett, A. W., on the habits of *Dromæus irroratus*, ii. 196.

Bennett, Dr., on birds of paradise, ii. 85.

Bernicla antarctica, colors of, ii. 218.

Bernicle gander pairing with a Canada goose, ii. 109.

Bettoni, E., on local differences in the nests of Italian birds, ii. 163.

Bhoteas, color of the beard in, ii. 304.

Bhringa, disciform tail-feathers of, ii. 86.

Bibio, sexual differences in the genus, i. 338.

Bichat, on beauty, ii. 338.

Bile, colored, in many animals, i. 314.

Bimana, i. 183.

Birds, imitations of the songs of other birds by, i. 42; dreaming, i. 44; language of, i. 53; sense of beauty in, i. 61; pleasure of, in incubation, i. 76; male, incubation by, i. 203; and reptiles, alliance of, i. 204; sexual differences in the beak of some, i. 247; migratory, arrival of the male before the female, i. 251; apparent relation between polygamy and marked sexual differences in, i. 261; monogamous, becoming polygamous under domestication, i. 262; eagerness of male in pursuit of the female, i. 263; wild, numerical proportion of the sexes in, i. 297; secondary sexual characters of, ii. 36; difference of size in the sexes of, ii. 41; fights of male, witnessed by females, ii. 46; display of male, to captivate the females, ii. 47; close attention of, to the songs of others, ii. 50; acquiring the song of their foster-parents, ii. 52; brilliant, rarely good songsters, ii. 53; love-antics and dances of, ii. 65; coloration of, ii. 71, *et seqq.;* moulting of, ii. 77, *et seqq.;* unpaired, ii. 99; male, singing out of season, ii. 102; mutual affection of, ii. 104; in confinement, distinguish persons, ii. 105; hybrid, production of, ii. 109; European, number of species of, ii. 119; variability of, ii. 119; gradation of secondary sexual characters in, ii. 129; obscurely colored, building concealed nests, ii. 161; young female acquiring male characters, ii. 172; breeding in immature plumage, ii. 205; moulting of, ii. 204; aquatic, frequency of white plumage in, ii. 219; vocal courtship of, ii. 315; naked skin of the head and neck in, ii. 377.

Birgus latro, habits of, i. 325.

Birkbeck, Mr., on the finding of new mates by Golden Eagles, ii. 100.

Birthplace of man, i. 191.

Births, numerical proportions of the sexes in, in animals and man, i. 255, 256; male and female, numerical proportion of, in England, i. 291.

Bischoff, Prof., on the agreement between the brains of man and of the Orang, i. 10; figure of the embryo of the dog, i. 15; on the convolutions of the brain in the human fœtus, i. 16; on the difference between the skulls of man and the quadrumana, i. 183.

Bishop, J., on the vocal organs of frogs, ii. 26; on the vocal organs of corvine birds, ii. 52; on the trachea of the *Merganser*, ii. 57.

Bison, American mane of the male, ii. 255.

Bitterns, dwarf, coloration of the sexes of, ii. 170.

Biziura lobata, musky odor of the male, ii. 36; large size of male, ii. 41.

Blackbird, sexual differences in the, i. 260; proportion of the sexes in the, i. 296; acquisition of a song by a, ii. 52; color of the beak in the sexes of the, ii. 69, 217; pairing with a thrush, ii. 109; colors and nidification of the, ii. 162; young of the, ii. 210; sexual difference in coloration of the, ii. 216.

Black-buck, Indian, sexual difference in the color of the, ii. 275.

Blackcap, arrival of the male, before the female, i. 251; young of the, ii. 210.

Black-cock, polygamous, i. 261; proportion of the sexes in the, i. 297; pugnacity and love-dance of the, ii. 42; call of the, ii. 58; moulting of the, ii. 79; duration of the courtship of the, ii. 96; sexual difference in coloration of the, ii. 216; crimson eye-cere of the, ii. 217; and pheasant, hybrids of, ii. 109.

Black-grouse, characters of young, ii. 177, 186.

Blackwall, J., on the speaking of the magpie, i. 57; on the desertion of their young by swallows, i. 80; on the superior activity of male spiders, i. 263; on the proportion of the sexes in spiders, i. 306; on sexual variation of color in spiders, i. 327; on male spiders, i. 328.

Bladder-nose Seal, hood of the, ii. 265.

Blaine, on the affections of dogs, ii. 258.

Blair, Dr., on the relative liability of Europeans to yellow fever, i. 234.

Blake, C. C., on the jaw from La Naulette, i. 122.

Blakiston, Capt., on the American snipe ii. 61; on the dances of *Tetrao phasianellus*, ii. 65.

Blasius, Dr., on the species of European birds, ii. 119.

Bledius taurus, hornlike processes of male, i. 363.

Bleeding, tendency to profuse, i. 283.

Blenkiron, Mr., on sexual preference in horses, ii. 260.

Blennies, crest developed on the head of male during the breeding-season, ii. 12.

Blethisa multipunctata, stridulation of, i. 368.

Bloch, on the proportions of the sexes in Fishes, i. 298.

Blood, arterial, red color of, i. 314.

Blood-pheasant, number of spurs in, ii. 43.

Bluebreast, red-throated, sexual differences of the, ii. 187.

Blumenbach, on Man, i. 107; on the large size of the nasal cavities in American aborigines, i. 114; on the position of man, i. 182; on the number of species of man, i. 218.

Blyth, E., observations on Indian crows, i. 74; on the structure of the hand in species of *Hylobates*, i. 135; on the ascertainment of the sex of nestling bullfinches by pulling out breast-feathers, ii. 23; on the pugnacity of the males of *Gallinula cristata*, ii. 39; on the presence of spurs in the female *Euplocamus erythrophthalmus*, ii. 44; on the pugnacity of the amadavat, ii. 47; on the spoonbill, ii. 57; on the moulting of *Anthus*, ii. 79; on the moulting of bustards, plovers, and *Gallus bankiva*, ii. 80; on the Indian honey-buzzard, ii. 121; on sexual differences in the color or the eyes of hornbills, ii. 123; on *Oriolus melanocephalus*, ii. 170; on *Palæornis Javanicus*, ii. 171; on the genus *Ardetta*, ii. 171; on the peregrine falcon, ii. 171; on young female birds acquiring male characters, ii. 172; on the immature plumage of birds, ii. 177; on representative species of birds, ii. 182; on the young of *Turnix*, ii. 193; on anomalous young of *Lanius rufus* and *Colymbus glacialis*, ii. 202; on the sexes and young of the sparrows, ii. 203; on dimorphism in some herons, ii. 205; on orioles breeding in immature plumage, ii. 205; on the sexes and young of *Buphus* and *Anastomus*, ii. 208; on the young of the blackcap and blackbird, ii. 210; on the young of the stonechat, ii. 211; on the white plumage of *Anastomus*, ii. 219; on the horns of *Antilope bezoartica*, ii. 235; on the horns of Bovine animals, ii. 236; on the mode of fighting of *Ovis cycloceros*, ii. 238; on the voice of the Gibbons, ii. 263; on the crest of the male wild-goat, ii. 268; on the colors of *Portax picta*, ii. 274; on the colors of *Antilope bezoartica*, ii. 275; on the development of the horns in the Koodoo and Eland antelopes, i. 279; on the color of the Axis deer, ii. 276; on sexual difference of color in *Hylobates hoolock*, ii. 277; on the hog-deer, ii. 289; on the beard and whiskers in the monkey becoming white with age, ii. 304.

Boar, wild, polygamous in India, i. 259; use of the tusks by the, ii. 245; fighting of, ii. 251.

Boitard and Corbié, MM., on the transmission of sexual peculiarities in pigeons, i. 274; on the antipathy shown by some female pigeons to certain males, ii. 114.

Bold, Mr., on the singing of a sterile hybrid canary, ii. 50.

Bombet, on the variability of the standard of beauty in Europe, ii. 354.

Bombus, difference of the sexes in, i. 355.

Bombycidæ, coloration of, i. 382; pairing of the, i. 388.

Bombycilla Carolinensis, red appendages of, ii. 171.

Bombyx cynthia, i. 336; proportion of the sexes in, i. 300, 304; pairing of, i. 388.

Bombyx mori, difference of size of the male and female cocoons of, i. 335; pairing of, i. 388.

Bombyx Pernyi, proportion of sexes of, i. 304.

Bombyx Yamamai, i. 336; M. Personnat on, i. 301; proportion of sexes of, i. 304.

Bonaparte, C. L., on the call-notes of the wild-turkey, ii. 58.

Bond, F., on the finding of new mates by crows, ii. 100.

Bone, implements of, skill displayed in making, i. 133.

Boner, C., on the transfer of male characters to an old female chamois, ii. 234; on the antlers of the red deer, ii. 241; on the habits of stags, ii. 248; on the pairing of red deer, ii. 256.

Bones, increase of, in length and thickness, when carrying a greater weight, i. 112.

Bonnet, monkey, i. 185.

Boomerang, i. 176.

Boreus hyemalis, scarcity of the male, i. 306.

Bory St. Vincent, on the number of species of man, i. 218; on the colors of *Labrus pavo*, ii. 15.

Bos gaurus, horns of, ii. 236.

Bos primigenius, ii. 229.

Bos sondaicus, horns of, ii. 236; colors of, ii. 275.

Botocudos, i. 174; mode of life of, i. 237; disfigurement of the ears and lower lip of the, ii. 325.

Boucher de Perthes, J. C. de, on the antiquity of man, i. 3.

Bourbon, proportion of the sexes in a species of *Papilio* from, i. 301.

Bourien, on the marriage-customs of the savages of the Malay Archipelago, ii. 357.

Bovidæ, dewlaps of, ii. 270.

Bower-birds, ii. 98; habits of the, ii. 66; ornamented playing-places of, i. 61, ii. 108.

Bows, use of, i. 224.

Brachiopoda, i. 315.

Brachycephalic structure, possible explanation of, i. 142.

Brachyscelus, second pair of antennæ in the male, i. 327.

Brachyura, i. 323.

Brachyurus calvus, scarlet face of, ii. 295.

Brain, of man, agreement of the, with that of lower animals, i. 10; convolutions of, in the human fœtus, i. 16; larger in some existing mammals than in their tertiary prototypes, i. 49; relation of the development of the, to the progress of language, i. 55; disease of the, affecting speech, i. 56; influence of development of mental faculties upon the size of the, i. 140; influence of the development of, on the spinal column and skull, i. 141; difference in the convolutions of, in different races of men, i. 208.

Brakenridge, Dr., on the influence of climate, i. 111.

Braubach, Prof., on the quasi-religious feeling of a dog toward his master, i. 66; on the self-restraint of dogs, i. 75.

Brauer, F., on dimorphism in *Neurothemis*, i. 352.

Brazil, skulls found in caves of, i. 210; population of, i. 216; compression of the nose by the natives of, ii. 335.

Break between man and the apes, i. 192.

Bream, proportion of the sexes in the, i. 299.

Breeding, age of, in birds, ii. 205.

Breeding season, sexual characters making their appearance in the, in birds, ii. 78.

Brehm, on the effects of intoxicating liquors on monkeys, i. 12; on the recognition of women by male *Cynocephali*, i. 13; on revenge taken by monkeys, i. 39; on manifestations of maternal affection by monkeys and baboons, i. 39; on the instinctive dread of monkeys for serpents, i. 41; on a baboon using a mat for shelter from the sun, i. 51; on the use of stones as missiles by baboons, i. 50; on the signal-cries of monkeys, i. 55; on sentinels posted by monkeys, i. 71; on coöperation of animals, i. 72; on an eagle attacking a young *Cercopithecus*, i. 73; on baboons in confinement protecting one of their number from punishment, i. 75; on the habits of baboons when plundering, i. 75; on the diversity of the mental faculties of monkeys, i. 106; on the habits of baboons, i. 136; on polygamy in *Cynocephalus* and *Cebus*, i. 258; on the numerical proportion of the sexes in birds, i. 297; on the love dance of the Black-cock, ii. 43; on *Palamedea cornuta*, ii. 45; on the habits of the Black-grouse, ii. 46; on sound produced by Birds of Paradise, ii. 60; on assemblages of grouse, ii. 97; on the finding of new mates by birds, ii. 102; on the fighting of wild-boars, ii. 251; on the habits of *Cynocephalus hamadryas*, ii. 346.

Brent, Mr., on the courtship of fowls, ii. 113.

Breslau, numerical proportion of male and female births in, i. 291.

Bridgman, Laura, i. 55.

Brimstone butterfly, i. 380; sexual difference of color in the, i. 396.

British, ancient, tattooing practised by, ii. 323.

Broca, Prof., on the occurrence of the supra-condyloid foramen in the human humerus, i. 28; on the capacity of Parisian skulls at different periods, i. 140; on the influence of natural selection, i. 146; on hybridity in man, i. 212; on human remains from Les Eyzies, i. 228; on the cause of the difference between Europeans and Hindoos, i. 231.

Brodie, Sir B., on the origin of the moral sense in man, i. 60.

Bronn, H. G., on the copulation of insects of distinct species, i. 332.

Bronze period, men of, in Europe, i. 154.

Brown, R., sentinels of seals generally females, i. 71; on the battles of seals, ii. 229; on the narwhal, ii. 231; on the occasional absence of the tusks in the female walrus, ii. 231; on the bladder-nose seal, ii. 265; on the colors of the sexes in *Phoca Grœnlandica*, ii. 273; on the appreciation of music by seals, ii. 317; on plants used as love-philters, by North American women, ii. 328.

Brown-Séquard, Dr., on the inheritance of the effects of operations by guinea-pigs, ii. 364.

Bruce, on the use of the elephant's tusks, ii. 237.

Brulerie, P. de la, on the habits of *Ateuchus cicatricosus*, i. 365; on the stridulation of *Ateuchus*, i. 373.

Brünnich, on the pied ravens of the Feroe islands, ii. 121.

Bryant, Captain, on the courtship of *Callorhinus ursinus*, ii. 257.

Bubas bison, thoracic projection of, i. 361.

Bucephalus capensis, difference of the sexes, of, in color, ii. 28.

Buceros, nidification and incubation of, ii. 161.

Buceros bicornis, sexual differences in the coloring of the casque, beak, and mouth in, ii. 123.

Buceros corrugatus, sexual difference in the beak of, ii. 69.

Buchner, L., on the origin of man, i. 4; on the want of self-consciousness, etc., in low savages, i. 60; on the use of the human foot as a prehensile organ, i. 136; on the mode of progression of the apes, i. 137.

Buckland, F., on the numerical proportion of the sexes in rats, i. 296; on the proportion of the sexes in the trout, i. 299; on *Chimæra monstrosa*, ii. 12.

Buckland, W., on the complexity of crinoids, i. 59.

Buckler, W., proportion of sexes of Lepidoptera reared by, i. 304.

Buckinghamshire, numerical proportion of male and female births in, i. 291.

Bucorax Abyssinicus, inflation of the neck-wattle of the male, during courtship, ii. 69.

Budytes Raii, i. 251.

Buffalo, Cape, ii. 239.

Buffalo, Indian, horns of the, ii. 236.

Buffalo, Italian, mode of fighting of the, ii. 239.

Buffon, on the number of species of man, i. 218.

Bugs, i. 339.

Buist, R., on the proportion of the sexes in salmon, i. 299; on the pugnacity of the male salmon, ii. 3.

Bulbul, pugnacity of the male, ii. 39; display of under tail-coverts by the male, ii. 91.

Bull, mode of fighting of the, ii. 238; curled frontal hair of the, ii. 269.

Bullfinch, sexual differences in the, i. 260; piping, ii. 50; female, singing of the, ii, 51; courtship of the, ii. 90; widowed, finding a new mate, ii. 101: attacking a reed-bunting, ii. 106; nestling, sex ascertained by pulling out breast-feathers, ii. 205.

Bullfinches distinguishing persons, ii. 105; rivalry of female, ii. 116.

Bulls, two young, attacking an old one, i. 72; wild, battles of, ii. 229.

Bull-trout, male, coloring of, during the breeding season, ii. 14.

Bunting, reed, head feathers of the male, ii. 91; attacked by a bullfinch, ii. 106.

Buntings, characters of young, ii. 176.

Buphus coromandus, sexes and young of, ii. 208; change of color in, ii. 221, 222.

Burchell, Dr., on the zebra, ii. 288; on the extravagance of a Bushwoman in adorning herself, ii. 327; celibacy unknown among the savages of South Africa, ii. 350; on the marriage-customs of the Bushwomen, ii. 357.

Burke, on the number of species of man, i. 218.

Burmese, color of the beard in, ii. 304.

Burton, Captain, on negro ideas of female beauty, ii. 330; on a universal ideal of beauty, ii. 334.

Bushmen, i. 151.

Bushwoman, extravagant ornamentation of a, ii. 327.

Bushwomen, hair of, i. 208; marriage-customs of, ii. 358.

Busk, Prof. G., on the occurrence of the supra-condyloid foramen in the human humerus, i. 28.

Bustard, throat-pouch of the male, ii. 55; humming noise produced by a male, ii. 62; Indian, ear-tufts of a, ii. 70.

Bustards, occurrence of sexual differences and of polygamy among the, i. 260; love-gestures of the male, ii. 65; double moult in, ii. 78, 80.

Butler, A. G., on sexual differences in the wings of *Aricoris epitus*, i. 335; on the coloring of the sexes in species of *Thecla*, i. 377; on the resemblance of *Iphias glaucippe* to a leaf, i. 381; on the rejection of certain moths and caterpillars by lizards and frogs, i. 404.

Butterfly, noise produced by a, i. 375; Emperor, i. 374, 376; meadow brown, instability of the ocellated spots of, ii. 127.

Butterflies, proportion of the sexes in, i. 300; fore-legs atrophied in some male, i. 334; sexual difference in the neuration of the wings of, i. 335; pugnacity of male, i. 374; protective resemblances of the lower surface of, i. 379; display of the wings by, i. 384; white, alighting upon bits of paper, i. 387; attracted by a dead specimen of the same species, i. 387; courtship of, i. 387; male and female, inhabiting different stations, i. 389.

Buxton, C., observations on macaws, i. 73; on an instance of benevolence in a parrot, ii. 105.

Buzzard, Indian honey-, variation in the crest of, ii. 121.

C.

Cabbage butterflies, i. 381.

Cachalot, large head of the male, ii. 231.

Cadences, musical, perception of, by animals, ii. 317.

Cæcum, i. 26; large, in the early progenitors of man, i. 198.

Cairina moschata, pugnacity of the male, ii. 39.

Callianassa, chelæ of, figured, i. 320.

Callionymus lyra, characters of the male, ii. 7.

Callorhinus ursinus, relative size of the sexes of, ii. 248; courtship of, ii. 257.

Calmucks, aversion of, to hairs on the face, ii. 332; marriage-customs of the, ii. 356.

Calotes nigrilabris, sexual difference in the color of, ii. 34.

Cambridge, O. Pickard, on the sexes of spiders, i. 306.

Camel, canine teeth of male, ii. 230, 246.

Campbell, J., on the Indian elephant, i. 259; on the proportion of male and female births in the harems of Siam, i. 294.

Campylopterus hemileucurus, i. 298.

Canaries distinguishing persons, ii. 106.

Canary, polygamy of the, i. 261; change of plumage in, after moulting, i. 284; female, selecting the best singing male, ii. 49; sterile hybrid, singing of a, ii. 50; female, singing of the, ii. 51; selecting a greenfinch, ii. 110; and siskin, pairing of, ii. 110.

Caudal vertebræ, number of, in macaques and baboons, i. 144; basal, of monkeys, embedded in the body, i. 145.

Canestrini, G., on rudimentary characters and the origin of man, i. 4; on rudimentary characters, i. 17; on the movement of the ear in man, i. 20; on the variability of the vermiform appendage in man, i. 27; on the abnormal division of the malar bone in man, i. 119; on abnormal conditions of the human uterus, i. 119; on the persistence of the frontal suture in man, i. 120; on the proportion of the sexes in silk-moths, i. 300, 302.

Canine teeth in man, i. 121; diminution of, in man, i. 139; diminution of, in horses, i. 139; disappearance of, in male ruminants, i. 139; large, in the early progenitors of man, i. 198.

Canines, and horns, inverse development of, ii. 245.

Canoes, use of, i. 132, 226.

Cantharis, difference of color in the sexes of a species of, i. 355.

Capercailzie, proportion of the sexes in the, i. 297; pugnacity of the male, ii. 42; pairing of the, ii. 47; autumn meetings of the, ii. 52; call of the, ii. 58; duration of the courtship of, ii. 96; behavior of the female, ii. 116; inconvenience of black color to the female, ii. 147; sexual difference in coloration of the, ii. 216; crimson eye-cere of the male, ii. 217; polygamous, i. 269.

Capital, i. 163.

Capitonidæ, colors and nidification of the, ii. 163.

Capra ægagrus, ii. 238; crest of the male, ii. 268; sexual difference in the color of, ii. 275.

Capreolus Sibiricus subecaudatus, ii. 284.

Caprice, common to man and animals, i. 62.

Caprimulgus, noise made by the males of some species of, with their wings, ii. 59.

Caprimulgus Virginianus, pairing of, ii. 47.

Carabidæ, bright colors of, i. 355.

Carbonnier, on the natural history of the pike, i. 299; on the relative size of the sexes in fishes, ii. 7.

Carcineutes, sexual difference of color in, ii. 165.

Carcinus mænas, i. 322, 323.

Carduelis elegans, sexual differences of the beak in, ii. 37.

Carnivora, marine, polygamous habits of, i. 259; sexual differences in the colors of, ii. 273.

Carp, numerical proportion of the sexes in the, i. 299.

Carr, R., on the peewit, ii. 46.

Carrier pigeon, late development of the wattle in the, i. 284.

Carrion beetles, stridulation of, i. 367.

Carus, Prof. V., on the development of the horns in merino sheep, i. 280.

Cassowary, sexes and incubation of the, ii. 195.

Castoreum, ii. 266.

Casuarius galeatus, ii. 195.

Cat, convoluted body in the extremity of

the tail of a, i. 29; sick, sympathy of a dog with a, i. 74.
CATARACT in *Cebus Azaræ*, i. 12.
CATARRH, liability of *Cebus Azaræ* to, i. 11.
CATARRHINE monkeys, i. 188.
CATERPILLARS, bright colors of, i. 402.
Cathartes aura, ii. 111.
Cathartes jota, love-gestures of the male, ii. 65.
CATLIN, G., on the development of the beard among North American Indians, ii. 307; on the great length of the hair in some North American tribes, ii. 331.
CATON, J. D., on the development of the horns in *Cervus Virginianus* and *strongyloceros*, i. 279; on the presence of traces of horns in the female wapiti, ii. 234; on the fighting of deer, ii. 241; on the crest of the male wapiti, ii. 268; on the colors of the Virginian deer, ii. 274; on sexual differences of color in the wapiti, ii. 276; on the spots of the Virginian deer, ii. 289.
CATS, dreaming, i. 44; tortoise-shell, i. 274, 276, 283; enticed by valerian, ii. 268; colors of, ii. 285.
CATTLE, domestic, sexual differences of, late developed, i. 281; rapid increase of, in South America, i. 130; domestic, lighter in winter in Siberia, i. 273; horns of, i. 278, ii. 236; numerical proportion of the sexes in, i. 295.
Cebus, maternal affection in a, i. 39; gradation of species of, i. 219.
Cebus Azaræ, liability of, to the same diseases as man, i. 11; distinct sounds produced by, i. 52; early maturity of the female, ii. 303.
Cebus capucinus, polygamous, i. 258; sexual differences of color in, ii. 277; hair on the head of, ii. 291.
Cebus vellerosus, hair on the head of, ii. 291.
CECIDOMYIDÆ, proportion of the sexes in, i. 305.
CELIBACY, unknown among the savages of South Africa and South America, ii. 350.
CENTIPEDES, i. 330.
CEPHALOPODA, absence of secondary sexual characters in, i. 316.
Cephalopterus ornatus, ii. 55–57.
Cephalopterus penduliger, ii. 57.
Cerambyx heros, stridulant organ of, i. 368.
Ceratophora aspera, nasal appendages of, ii. 32.
Ceratophora Stoddartii, nasal horn of, ii. 32.
Cerceris, habits of, i. 353.
Cercocebus Æthiops, whiskers, etc., of, ii. 295.
Cercopithecus, young, seized by an eagle and rescued by the troop, i. 73; definition of species of, i. 219.
Cercopithecus cephus, sexual difference of color in, ii. 277, 296.
Cercopithecus cynosurus and *griseo-viridis*, color of the scrotum in, ii. 277.
Cercopithecus Diana, sexual differences of color in, ii. 277, 296. 297.
Cercopithecus griseo-viridis, i. 72.
Cercopithecus petaurista, whiskers, etc., of, ii. 293.
CERES, of birds, bright colors of, ii. 217.
Ceriornis Temminckii, swelling of the wattles of the male during courtship, ii. 68.
Cervulus, weapons of, ii. 245.
Cervulus moschatus, rudimentary horns of the female, ii. 234.
Cervus alces, i. 279.
Cervus campestris, odor of, ii. 266.
Cervus Canadensis, traces of horns in the female, ii. 234; attacking a man, ii. 242; sexual difference in the color of, ii. 276.
Cervus elaphus, battles of male, ii. 229; horns of, with numerous points, ii. 241.
Cervus Eldi, i. 279.
Cervus mantchuricus, ii. 289.
Cervus paludosus, colors of, ii. 276.
Cervus strongyloceros, i. 279.
Cervus Virginianus, i. 279; horns of, in course of modification, ii. 243.
Ceryle, male black-belted in some species of, ii. 165.
CETACEA, nakedness of, i. 142.
CEYLON, frequent absence of beard in the natives of, ii. 306.
CHAFFINCH, proportion of the sexes in the, i. 297, 298; courtship of the, ii. 90.
CHAFFINCHES, ii. 51; new mates found by, ii. 101.
Chalcophaps Indicus, characters of young, ii. 177.
Chalcosoma atlas, sexual differences of, i. 357.
Chamæleon, sexual differences in the genus, ii. 32.
Chamæleon bifurcus, ii. 32, 34.
Chamæleon Owenii, ii. 33, 34.
CHAMELEONS, ii. 31.
CHAMOIS, danger-signals of, i. 71; transfer of male characters to an old female, ii. 233.
Chamæpetes unicolor, modified wing-feather in the male, ii. 61.
CHAPUIS, Dr., on the transmission of sexual peculiarities in pigeons, i. 274; on streaked Belgian pigeons, i. 284, ii 150.
CHAR, male, coloring of, during the breeding-season, ii. 13.
CHARACTERS, male, developed in females, i. 271; natural, artificial exaggeration of, by man, ii. 335; secondary sexual, transmitted through both sexes, i. 270.
Charadrius hiaticula and *pluvialis*, sexes and young of, ii. 207.
CHARDIN on the Persians, ii. 340.
CHARMS, worn by women, ii. 328.
CHARRUAS, freedom of divorce among the, ii. 356.
Chasmorhynchus, difference of color in the sexes of, ii. 75; colors of, ii. 218.
CHASTITY, early estimation of, i. 92.
CHATTERERS, sexual differences in, i. 260.

CHEIROPTERA, absence of secondary sexual characters in, i. 259.

CHELÆ of crustacea, i. 320, 327.

CHELONIA, sexual differences in, ii. 26.

Chenalopex Ægyptiacus, wing-knobs of, ii. 44.

Chera progne, ii. 80, 116.

CHEST, proportions of, in soldiers and sailors, i. 112; large, of the Quechua and Aymara Indians, i. 115.

CHEVROTAINS, canine teeth of, ii. 246.

Chiasognathus, stridulation of, i. 372.

Chiasognathus Grantii, mandibles of, i. 366.

CHILDREN, legitimate and illegitimate, proportion of the sexes in, i. 292.

CHILOE, lice of the natives of, i. 212; population of, i. 217.

Chimæra monstrosa, bony process on the head of the male, ii. 12.

CHIMÆROID fishes, prehensile organs of male, ii. 1.

CHIMPANZEE, ii. 308; ears of the, i. 21; representatives of the eyebrows in the, i. 25; platforms built by the, i. 35; cracking nuts with a stone, i. 49; hands of the, i. 133; absence of mastoid processes in the, i. 138; direction of the hair on the arms of the, i. 185; supposed evolution of the, i. 222; polygamous and social habits of the, ii. 345.

CHINA, North, idea of female beauty in, ii. 328.

CHINA, Southern, inhabitants of, i. 237.

CHINESE, use of flint tools by the, i. 176; difficulty of distinguishing the races of the, i. 207; color of the beard in, ii. 304; general beardlessness of the, ii. 306; opinions of the, on the appearance of Europeans and Cingalese, ii. 329, 331; compression of the feet of, ii. 336.

CHINSURDI, his opinion of beards, ii. 329, 333.

Chlamydera maculata, ii. 67.

Chloëon, pedunculated eyes of the male of, i. 332.

Chloephaga, coloration of the sexes in, ii. 170.

Chlorocœlus Tanana (figured), i. 345.

CHORDA DORSALIS, i. 199.

CHOUGH, red beak of the, ii. 217.

CHROMIDÆ, frontal protuberance in male, ii. 13; sexual difference in color of, ii. 20.

Chrysemys picta, long claws of the male, ii. 27.

Chrysococcyx, characters of young of, ii. 177.

Chrysomela cerealis, bright colors of, i. 355.

CHRYSOMELIDÆ, stridulation of, i. 367.

Cicada pruinosa, i. 341.

Cicada septendecim, i. 341.

CICADÆ, songs of the, i. 340; rudimentary sound-organs in females of, i. 348.

CICATRIX of a burn, causing modification of the facial bones, i. 141.

Cichla, frontal protuberance of male, ii. 13.

CIMETIÈRE du Sud, Paris, i. 28.

Cincloramphus cruralis, large size of male, ii. 41.

Cinclus aquaticus, ii. 162.

CINGALESE, Chinese opinion of the appearance of the, ii. 329.

CIRRIPEDES, complemental males of, i. 247.

CIVILIZATION, effects of, upon natural selection, i. 164; influence of, in the competition of nations, i. 230.

CLANGING of Geese, etc., ii. 49.

CLAPARÈDE, E., on natural selection applied to man, i. 132.

CLARKE, on the marriage-customs of the Calmucks, ii. 357.

CLASSIFICATION, i. 181.

CLAUS, C., on the sexes of *Saphirina*, i. 326.

CLEFT-PALATE, inherited, i. 116.

Climacteris erythrops, sexes of, ii. 197.

CLIMATE, i. 111; cool, favorable to human progress, i. 160; power of supporting extremes of, by man, i. 228; want of connection of, with color, i. 232.

CLOACA, existence of a, in the early progenitors of man, i. 198.

CLOACAL passage existing in the human embryo, i. 17.

CLUB, origin of the, i. 225.

CLUCKING of fowls, ii. 49.

Clythra 4-punctata, stridulation of, i. 367.

COBRA, ingenuity of a, ii. 29.

Coccus, i. 179.

COCCYX, i. 28, 29; in the human embryo, i. 16; convoluted body at the extremity of the, i. 29; embedded in the body, i. 145.

COCHIN-CHINA, notions of beauty of the inhabitants of, ii. 329, 331.

COCK, game, killing a kite, ii. 42; blind, fed by its companions, i. 74; comb and wattles of the, ii. 94; preference shown by the, for young hens, ii. 117; game, transparent zone in the hackles of a, ii. 130.

COCK of the rock, ii. 96.

COCKATOOS, ii. 216, 218, 220; nestling, ii. 105; black, immature plumage of, ii. 180.

CŒLENTERATA, absence of secondary sexual characters in, i. 312.

COFFEE, fondness of monkeys for, i. 12.

COLD, supposed effects of, i. 113; power of supporting, by man, i. 229.

COLEOPTERA, i. 355; stridulant organs of, discussed, i. 369.

COLLINGWOOD, C., on the pugnacity of the butterflies of Borneo, i. 375; on butterflies being attracted by a dead specimen of the same species, i. 387.

COLOMBIA, flattened heads of savages of, ii. 324.

COLONISTS, success of the English as, i. 172.

COLORATION, protective, in birds, ii. 213.

COLOR, supposed to be dependent on light and heat, i. 111; correlation of, with immunity from certain poisons and parasites, i. 233; purpose of, in lepidoptera, i. 387; relation of, to sexual functions, in

fishes. ii. 14; difference of, in the sexes of snakes, ii. 27; sexual differences of, in lizards, ii. 34; influence of, in the pairing of birds of different species, ii. 111; relation of, to nidification, ii. 159, 164; sexual differences of, in mammals, ii. 272, 280; recognition of, by quadrupeds, ii. 281; of children, in different races of man, ii. 303; of the skin in man, ii. 364.
Colors, admired alike by man and animals, i. 62; bright, due to sexual selection, i. 313; bright, among the lower animals, i. 313, 314; bright, protective to butterflies and moths, i. 382; bright, in male fishes, ii. 7, 13; transmission of, in birds, ii. 152.
Colquhoun, example of reasoning in a retriever, i. 46.
Columba passerina, young of, ii. 180.
Colymbus glacialis, anomalous young of, ii. 202.
Comb, development of, in fowls, i. 285.
Combs and wattles in male birds, ii. 94.
Community, preservation of variations useful to the, by natural selection, i. 149.
Compositæ, gradation of species among the, i. 219.
Comte, C., on the expression of the ideal of beauty by sculpture, ii. 363.
Conditions of life, action of changed, upon man, i. 109; influence of, on plumage of birds, ii. 188.
Condor, eyes and comb of the, ii. 124.
Conjugations, origin of, i. 59.
Conscience, i. 87, 100; absence of, in some criminals, i. 88.
Constitution, difference of, in different races of men, i. 208.
Consumption, liability of *Cebus Azaræ* to, i. 12; connection between complexion and, i. 235.
Convergence, i. 221.
Cooing of pigeons and doves, ii. 58.
Cook, Captain, on the nobles of the Sandwich Islands, ii. 340.
Cope, E. D., on the dinosauria, i. 196; on the origin of genera, ii. 206.
Cophotis ceylanica, sexual differences of, ii. 31, 34.
Copris, i. 359.
Copris Isidis, sexual differences of, i. 358.
Copris lunaris, stridulation of, i. 369.
Corals, bright colors of, i. 313.
Coral-snakes, ii. 29.
Cordylus, sexual difference of color in a species of, ii. 34.
Corfu, habits of the chaffinch in, i. 298.
Cornelius, on the proportions of the sexes in *Lucanus Cervus*, i. 305.
Corpora Wolffiana, i. 199; agreement of, with the kidneys of fishes, i. 16.
Correlated variation, i. 125.
Correlation, influence of, in the production of races i. 238.
Corse, on the mode of fighting of the elephant, ii. 245.
Corvus corone, ii. 100.
Corvus graculus, red beak of, ii. 217.
Cornus pica, nuptial assembly of, ii. 98.
Corydalis cornutus, large jaws of the male, i. 332.
Cosmetornis, ii. 173.
Cosmetornis vexillarius, elongation of wing-feathers in, ii. 69, 92.
Cotingidæ, sexual differences in, i. 260; coloration of the sexes of, ii. 169; resemblance of the females of distinct species of, ii. 184.
Cottus scorpius, sexual differences in, ii. 9.
Counting, origin of, i. 174; limited power of, in primeval man, i. 226.
Courage, variability of, in the same species, i. 39; universal high appreciation of, i. 91; importance of, i. 156; a characteristic of men, ii. 313.
Courtship, greater eagerness of males in, i. 263; of fishes, ii. 2; of birds, ii. 47, 96.
Cow, winter change of the, ii. 284.
Crab, devil, i. 323.
Crab, shore habits of, i. 322.
Crabro cribrarius, dilated tibiæ of the male, i. 333.
Crabs, proportions of the sexes in, i. 307.
Cranz, on the inheritance of dexterity in seal-catching, i. 113.
Crawfurd, on the number of species of man, i. 218.
Crenilabrus masa and *C. melops*, nests built by, ii. 19.
Crest, origin of, in Polish fowls, i. 275.
Crests, of birds, difference of, in the sexes, ii. 181; dorsal hairy, of mammals, ii. 268.
Cricket, field-, stridulation of the, i. 342; pugnacity of male, i. 349.
Cricket, house-, stridulation of the, i. 342, 349.
Crickets, sexual differences in, i. 350.
Crioceridæ, stridulation of the, i. 367.
Crinoids, complexity of, i. 59.
Croaking of frogs, ii. 25.
Crocodiles, musky odor of, during the breeding-season, ii. 27.
Crocodilia, ii. 27.
Crossbills, characters of young, ii. 176.
Crosses in man, i. 217.
Crossing of races, effects of the, i. 232.
Crossoptilon auritum, ii. 89, 158, 187; adornment of both sexes of, i. 280; sexes alike in, ii. 170.
Crotch, G. R., on the stridulation of beetles, i. 367, 370; on the stridulation of *Heliopathes*, i. 372; on the stridulation of *Acalles*, i. 372.
Crow Indians, long hair of the, ii. 331.
Crow, young of the, ii. 200.
Crows, ii. 216; vocal organs of the, ii. 52; living in triplets, ii. 102.
Crows, carrion, new mates found by, ii. 100.
Crows, Indian, feeding their blind companions, i. 74.
Cruelty of savages to animals, i. 91.
Crustacea, amphipod, males sexually mature while young, ii. 206; parasitic, loss of limbs by female, i. 247; prehensile feet and antennæ of, i. 248; male, more

active than female, i. 263; parthenogenesis in, i. 307; secondary sexual characters of, i. 318; auditory hairs of ii. 317.
Crystal worn in the lower lip by some Central African women, ii. 325.
Cuckoo fowls, i. 285.
Culicidæ, i. 246, 339.
Cullen, Dr., on the throat-pouch of the male bustard, ii. 55.
Cultivation of plants, probable origin of, i. 161.
Cupples, Mr., on the numerical proportion of the sexes in dogs, sheep, and cattle, i. 294, 295; on the Scotch deerhound, ii. 249; on sexual preference in dogs, ii. 259.
Curculionidæ, sexual difference in length of snout in some, i. 247; hornlike processes in male, i. 362; musical, i. 366, 368.
Curiosity, manifestations of, by animals, i. 41.
Curlews, double moult in, ii. 77.
Cursores, comparative absence of sexual difference among the, i. 261.
Curtis, J., on the proportion of the sexes in *Athalia*, i. 305.
Cuvier, F., on the recognition of women by male quadrumana, i. 13.
Cuvier, G., views of, as to the position of man, i. 183; on instinct and intelligence, i. 36; on the number of caudal vertebræ in the mandrill, i. 144; on the position of the seals, i. 183; on *Hectocotyle*, i. 316.
Cyanecula suecica, sexual differences of, ii. 187.
Cyanalcyon, sexual difference in colors of, ii. 165; immature plumage of, ii. 180.
Cychrus, sounds produced by, i. 370.
Cycinia mendica, sexual difference of color in, i. 386.
Cygnus ferus, trachea of, ii. 57.
Cygnus olor, white young of, ii. 202.
Cyllo Leda, instability of the ocellated spots of, ii. 127.
Cynanthus, variation in the genus, ii. 120.
Cynipidæ, proportions of the sexes in, i. 305.
Cynocephalus, difference of the young, from the adult, i. 13; male, recognition of women by, i. 13; polygamous habits of species of, i. 258.
Cynocephalus chacma, i. 40.
Cynocephalus gelada, i. 50.
Cynocephalus hamadryas, i. 50; sexual difference of color in, ii. 278.
Cynocephalus leucophus, colors of the sexes of, ii. 278.
Cynocephalus mormon, colors of the male, ii. 278, 282, 296.
Cynocephalus porcarius, mane of the male ii. 255.
Cypridina, proportions of the sexes in, i. 307.
Cyprinidæ, proportion of the sexes in the, i. 299.
Cyprinidæ, Indian, ii. 17.
Cyprinodontidæ, sexual differences in the, ii. 7, 9.
Cyprinus auratus, ii. 16.
Cyprinus phoxinus, spawning of, ii. 15.
Cypris, relations of the sexes in, i. 307.
Cystophora cristata, hood of, ii. 265.

D.

Dacelo, sexual difference of color in, ii. 166.
Dacelo Gaudichaudi, young male of, ii. 180.
Dal-ripa, a kind of ptarmigan, i. 297.
Damalis albifrons, peculiar markings of, ii. 287.
Damalis pygarga, peculiar markings of, ii. 287.
Dampness of climate, supposed influence of, on the color of the skin, i. 111, 233.
Danaidæ, i. 376.
Dances of birds, ii. 65.
Dancing, i. 224.
Daniell, Dr., his experience of residence in West Africa, i. 236.
Darfur, protuberances artificially produced in, ii. 223.
Darwin, F., on the stridulation of *Dermestes murinus*, i. 368.
Dasychira pudibunda, sexual difference of color in, i. 386.
Davis, A. H., on the pugnacity of the male stag-beetle, i. 364.
Davis, J. B., on the capacity of the skull in various races of men, i. 140; on the beards of the Polynesians, ii. 306.
Death-rate higher in towns than in rural districts, i. 169.
Death-tick, i. 373.
De Candolle, Alph., on a case of inherited power of moving the scalp, i. 19.
Declensions, origin of, i. 59.
Decoration in birds, ii. 68.
Decticus, i. 345.
Deer, spots of young, ii. 176, 288; horns of, ii. 232, 238; use of horns of, ii. 240, 251; size of the horns of, ii. 247; female pairing with one male, while others are fighting for her, ii. 256; male, attracted by the voice of the female, ii. 263; male, odor emitted by, ii. 266; development of the horns in, i. 278; horns of a, in course of modification, ii. 243.
Deer, Axis, sexual difference in the color of the, ii. 276.
Deer, fallow, different colored herds of, ii. 281.
Deer, Mantchurian, ii. 289.
Deer, Virginian, ii. 289; color of the, not affected by castration, ii. 274; colors of, ii. 276.
Deerhound, Scotch, greater size of the male, i. 283, ii. 254.
Defensive organs of mammals, ii. 251.
De Geer, C., on a female spider destroying a male, i. 329.

Dekay, Dr., on the bladder-nose seal, ii. 265.
Demerara, yellow fever in, i. 234.
Dendrocygna, ii. 177.
Dendrophila frontalis, young of, ii. 211.
Denny, H., on the lice of domestic animals, i. 211.
Dermestes murinus, stridulation of, i. 368.
Descent traced through the mother alone, ii. 343.
Deserts, protective coloring of animals inhabiting, ii. 214.
Desmarest, on the absence of suborbital pits in *Antilope subgutturosa*, ii. 267; on the whiskers of *Macacus*, ii. 269; on the color of the opossum, ii. 275; on the colors of the sexes of *Mus minutus*, ii. 273; on the coloring of the ocelot, ii. 273; on the colors of seals, ii. 273; on *Antilope caama*, ii. 275; on the colors of goats, ii. 276; on sexual difference of color in *Ateles marginatus*, ii. 277; on the mandrill, ii. 278; on *Macacus cynomolgus*, ii. 303.
Desmoulins, on the number of species of man, i. 218; on the musk-deer, ii. 267.
Desor, on the imitation of man by monkeys, i. 42.
Despine, P., on criminals destitute of conscience, i. 89.
Development, embryonic, of man, i. 14, 16; correlated, ii. 125.
Devil, not believed in by the Fuegians, i. 65.
Devil-crab, i. 323.
Devonian, fossil insect from the, i. 349.
Dewlaps, of cattle and antelopes, ii. 270.
Diadema, sexual differences of coloring in the species of, i. 376.
Diadema anomala, mimicry by the female of, i. 400.
Diadema bolina, i. 400.
Diamond-beetles, bright colors of, i. 355.
Diastema, occurrence of, in man, i. 121.
Diastylidæ, proportion of the sexes in, i. 301.
Diodorus, on the absence of beard in the natives of Ceylon, ii. 306.
Dicrurus, racket-shaped feathers in, ii. 70; nidification of, ii. 160.
Dicrurus macrocercus, change of plumage in, ii. 171.
Didelphis opossum, sexual difference in the color of, ii. 272.
Differences, comparative, between different species of birds of the same sex, ii. 184.
Digits, supernumerary, more frequent in men than in women, i. 265; supernumerary, inheritance of, i. 276; supernumerary, early development of, i. 282.
Dimorphism, in females of water-beetles, i. 333; in *Neurothemis* and *Agrion*, i. 352.
Dipelicus Cantori, sexual differences of, i. 358.
Diplopoda, prehensile limbs of the male, i. 330.
Dipsas cynodon, sexual difference in the color of, ii. 28.
Diptera, i. 338.
Disease, generated by the contact of distinct peoples, i. 230.
Diseases common to man and the lower animals, i. 11; differences of liability to, in different races of men, i. 208; new, effects of, upon savages, i. 229; sexually limited, i. 283.
Display, coloration of Lepidoptera for, i. 383; of plumage by male birds, ii. 82, 91.
Distribution, wide, of man, i. 131; geographical, as evidence of specific distinctness in man, i. 210.
Disuse, effects of, in producing rudimentary organs, i. 18; and use of parts, effects of, i. 112; of parts, influence of, on the races of men, i. 238.
Divorce, freedom of, among the Charruas, ii. 356.
Dixon, E. S., on the habits of the guinea fowl, i. 261; on the pairing of different species of geese, ii. 109; on the courtship of peafowl, ii. 116.
Dobrizhoffer, on the marriage-customs of the Alipones, ii. 357.
Dogs, suffering from Tertian ague, i. 13; memory of, i. 43; domestic, progress of, in moral qualities, i. 49; distinct tones uttered by, i. 52; parallelism between his affection for his master and religious feeling, i. 65; sociability of the, i. 71; sympathy of, with a sick cat, i. 74; sympathy of, with his master, i. 74; possible use of the hair on the fore-legs of the, i. 185; races of the, i. 221; diverging when drawing sledges over thin ice, i. 45; dreaming, i. 44, 152; exercise of reasoning faculties by, i. 47; their possession of conscience, i. 75; numerical proportion of male and female births in, i. 294; sexual affection between individuals of, ii. 258; howling at certain notes, ii. 317; rolling in carrion, ii. 267.
Dolichocephalic structure, possible cause of, i. 142.
Dolphins, nakedness of, i. 142.
Domestic animals, races of, i. 221; change of breeds of, ii. 352.
Domestication, influence of, in removing the sterility of hybrids, i. 214.
D'Orbigny, A., on the influence of dampness and dryness on the color of the skin, i. 232: on the Yuracaras, ii. 331.
Dotterel, ii. 195.
Doubleday, E., on sexual differences in the wings of butterflies, i. 334.
Doubleday, H., on the proportion of the sexes in the smaller moths, i. 302; on the attraction of the males of *Lasiocampa quercus* and *Saturnia carpini* by the female, i. 303; on the proportion of the sexes in the Lepidoptera, i. 303; on the ticking of *Anobium tessellatum*, i. 373; on the structure of *Ageronia feronia*, i. 375; on white butterflies alighting upon paper, i. 378.

DOUGLAS, J. W., on the sexual differences of the *Hemiptera*, i. 339; on the colors of British *Homoptera*, i. 341.
DOWN, of birds, ii. 77.
Draco, gular appendages of, ii. 31.
DRAGONET, Gemmeous, ii. 7.
DRAGON-FLIES, caudal appendages of male, i. 334; relative size of the sexes of, i. 337; difference in the sexes of, i. 351; want of pugnacity by the male, i. 353.
DRAKE, breeding plumage of the, ii. 81.
DREAMS, i. 44; a possible source of the belief in spiritual agencies, i. 64.
DRILL, sexual difference of color in the, ii. 278.
Dromœus irroratus, ii. 196.
Dromolœa, Saharan species of, ii. 164.
DRONGO shrike, ii. 171.
DRONGOS, racket-shaped feathers in the tails of, ii. 70, 80.
DRYNESS, of climate, supposed influence of, on the color of the skin, i. 233.
Dryopithecus, i. 191.
DUCK, harlequin, age of mature plumage in the, ii. 204; breeding in immature plumage, ii. 205.
DUCK, long-tailed, preference of male, for certain females, ii. 117.
DUCK, pintail, pairing with a wigeon, ii. 109.
DUCK, voice of the, ii. 57; pairing with a shield-drake, ii. 109; immature plumage of the, ii. 180.
DUCK, wild, sexual differences in the, i. 260; speculum and male characters of, i. 281; pairing with a pintail drake, ii. 110.
DUCKS, dogs and cats recognized by, ii. 106; wild, becoming polygamous under partial domestication, i. 261.
DUGONG, tusks of, ii. 231; nakedness of, i. 142.
DUJARDIN, on the relative size of the cerebral ganglia in insects, i. 139.
DUNCAN, Dr., on the fertility of early marriages, i. 167.
DUPONT, M., on the occurrence of the supra-condyloid foramen in the humerus of man, i. 28.
DURAND, J. P., on causes of variation, i. 109.
DUREAU de la Malle, on the songs of birds, i. 53; on the acquisition of an air by blackbirds, ii. 52.
DUTCH, retention of their color by the, in South Africa, i. 233.
DUTY, sense of, i. 67.
DUVAUCEL, female *Hylobates* washing her young, i. 39.
DYAKS, pride of, in mere homicide, i. 90.
Dynastes, large size of males of, i. 337.
DYNASTINI, stridulation of, i. 369.
Dytiscus, dimorphism of females of, i. 333; grooved elytra of the female, i. 333.

E.

EAGLE, young *Cercopithecus* rescued from, by the troop, i. 72.
EAGLE, white-headed, breeding in immature plumage, ii. 205.
EAGLES, golden, new mates found by, ii. 100.
EAR, motion of the, i. 20; external shell of the, useless in man, i. 21; rudimentary point of the, in man, i. 21.
EARS, piercing and ornamentation of the, ii. 325.
Echidna, i. 193.
Echini, bright colors of some, i. 313.
ECHINODERMATA, absence of secondary sexual characters in, i. 312.
ECKER, figure of the human embryo, i. 15; on sexual differences in the pelvis in man, ii. 302; on the presence of a sagittal crest in Australians, ii. 304.
EDENTATA, former wide range of, in America, i. 211; absence of secondary sexual characters in, i. 259.
Edolius, racket-shaped feathers in, ii. 70.
EDWARDS, Mr., on the proportion of the sexes in North American species of *Papilio*, i. 301.
EGERTON, Sir P., on the use of the antlers of deer, ii. 241; on the pairing of red deer, ii. 257; on the bellowing of stags, ii. 261.
EGGS, hatched by male fishes, ii. 19.
EGRET, Indian, sexes and young of, ii. 208.
EGRETS, breeding plumage of, ii. 78; white, ii. 218.
EHRENBERG, on the mane of the male Hamadryas baboon, ii. 255.
EKSTROM, M., on *Harelda glacialis*, ii. 117.
Elachista rufocinerea, habits of male, i. 303.
ELAND, development of the horns of the, i. 280.
ELANDS, sexual differences of color in, ii. 274.
Elaphomyia, sexual differences in, i. 338.
Elaphrus uliginosus, stridulation of, i. 368.
Elaps, ii. 30.
ELATERIDÆ, proportions of the sexes in, i. 305.
ELATERS, luminous, i. 335.
ELEPHANT, i. 193; nakedness of the, i. 145; rate of increase of the, i. 130; Indian, polygamous habits of the, i. 259; pugnacity of the male, ii. 229; tusks of, ii. 231, 232, 237, 247; Indian, mode of fighting, of the, ii. 245; male, odor emitted by the, ii. 266; attacking white or gray horses, ii. 281.
ELEVATION of abode, modifying influence of, i. 116.
ELIMINATION of inferior individuals, i. 165.
ELK, ii. 237; winter change of the, ii. 284.
ELK, Irish, horns of the, ii. 247.
ELLICE Islands, beards of the natives, ii. 307, 333.
ELLIOT, R., on the numerical proportion of the sexes in young rats, i. 296; on the proportion of the sexes in sheep, i. 296.
ELLIOTT, D. G., on *Pelecanus erythrorhynchus*, ii. 77.
ELLIOTT, Sir W., on the polygamous habits of the Indian wild-boar, i. 259.

Ellis, on the prevalence of infanticide in Polynesia, ii. 347.

Elphinstone, Mr., on local differences of stature among the Hindoos, i. 110; on the difficulty of distinguishing the native races of India, i. 207.

Elytra, of the females of *Dytiscus*, *Acilius*, *Hydroporus*, i. 333.

Emberiza, characters of young, ii. 176.

Emberiza miliaria, ii. 177.

Emberiza schœniclus, ii. 106; head-feathers of the male, ii. 91.

Embryo of man, i. 14, 15; of the dog, i. 15.

Embryos of mammals, resemblance of the, i. 31.

Emigration, i. 166.

Emotions experienced by the lower animals in common with man, i. 38; manifested by animals, i. 41.

Emperor moth, i. 385.

Emulation of singing-birds, ii. 50.

Emu, sexes and incubation of, ii. 196.

Endurance, estimation of, i. 91.

Energy, a characteristic of men, ii. 313.

England, numerical proportion of male and female births, in, i. 291.

Engleheart, Mr., on the finding of new mates by starlings, ii. 101.

English, success of, as colonists, i. 172.

Engravers, short-sighted, i. 113.

Entomostraca, i. 323.

Entozoa, difference of color between the males and females of some, i. 312.

Eocene, possible divergence of man during the, i. 192.

Eolidæ, colors of, produced by the biliary glands, i. 314.

Epeira, i. 328.

Epeira nigra, small size of the male of, i. 329.

Ephemeræ, i. 331.

Ephemeridæ, i. 350.

Ephemerina, i. proportions of the sexes in, i. 306.

Ephippiger vitium, stridulating organs of, i. 344, 348.

Epicalia, sexual differences of coloring in the species of, i. 376.

Equus hemionus, winter change of, ii. 284.

Erateina, coloration of, i. 385.

Erect attitude of man, i. 136.

Eschricht, on the development of hair in man, i. 24; on a lanuginous mustache in a female fœtus, i. 25; on the want of definition between the scalp and the forehead in some children, i. 186; on the arrangement of the hair in the human fœtus, i. 186; on the hairiness of the face in the human fœtus of both sexes, ii. 362, 363.

Esmeralda, difference of color in the sexes of, i. 356.

Esox lucius, i. 293.

Esox reticulatus, ii. 14.

Esquimaux, i. 151, 160; their belief in the inheritance of dexterity in seal-catching, i. 113; mode of life of, i. 237.

Estrelda amandava, pugnacity of the male, ii. 46.

Eubagis, sexual differences of coloring in the species of, i. 377.

Euchirus longimanus, sound produced by, i. 370.

Eudromias morinellus, ii. 194.

Eulampis jugularis, colors of the female, ii. 160.

Euler, on the rate of increase in the United States, i. 126.

Eumomota superciliaris, racket-shaped feathers in the tail of, ii. 70.

Eupetomena macroura, colors of the female, ii. 160.

Euphema splendida, ii. 166.

Euplocamus erythrophthalmus, possession of spurs by the female, ii. 44.

Euplœa midamas, mimickry of, by the female of *Diadema anomala*, i. 400.

Europe, ancient inhabitants of, i. 228.

Europeans, difference of, from Hindoos, i. 231; hairiness of, probably due to reversion, ii. 361.

Eurostopodus, sexes of, ii. 197.

Eurygnathus, different proportions of the head in the sexes of, i. 334.

Eustephanus, sexual differences of species of, ii. 37; young of, ii. 211.

Exaggeration of natural characters by man, ii. 334.

Exogamy, ii. 344, 348.

Expression, resemblances in, between man and the apes, i. 184.

Extinction of races, causes of, i. 229.

Eye, destruction of the, i. 112; change of position in, i. 141; obliquity of, regarded as a beauty by the Chinese and Japanese, ii. 328.

Eyebrows, elevation of, i. 19; development of long hairs in, i. 24; in monkeys, i. 185; eradicated in parts of South America and Africa, ii. 324; eradication of, by the Indians of Paraguay, ii. 332.

Eyelids, colored black, in part of Africa, ii. 323.

Eyelashes, eradication of, by the Indians of Paraguay, ii. 332.

Eyes, difference in the color of, in the sexes of birds, ii. 123; pillared, of the male of *Chloëon*, i. 331.

Eyton, T. C., observations on the development of the horns in the fallow-deer, i. 279.

Eyzies, Les, human remains from, i. 228.

F.

Fabre, M., on the habits of *Cerceris*, i. 353.

Facial bones, causes of modification of the, i. 141.

Faculties, mental, variation of, in the same species, i. 35; diversity of, in the same race of men, i. 105; inheritance of, i. 106; diversity of, in animals of the same species, i. 106; of birds, ii. 104.

FAKIRS, Indian, tortures undergone by, i. 92.
Falco leucocephalus, ii. 205.
Falco peregrinus, ii. 100, 179.
Falco tinnunculus, ii 100.
FALCON, peregrine, new mate found by, ii. 100.
FALCONER, H., on the mode of fighting of the Indian elephant, ii. 245; on canines in a female deer, ii. 246; on *Ilyomoschus aquaticus*, ii. 289.
FALKLAND islands, horses of, i. 227.
FALLOW-DEER, different colored herds of, ii. 281.
FAMINES, frequency of, among savages, i. 229.
FARR, Dr., on the structure of the uterus, i. 118; on the effects of profligacy, i. 166; on the influence of marriage on mortality, i 169.
FARRAR, F. W., on the origin of language, i. 54; on the crossing or blending of languages, i. 58; on the absence of the idea of God in certain races of men, i. 63; on early marriages of the poor, i. 167; on the middle ages, i. 172.
FASHIONS, long prevalence of, among savages, ii. 327, 336.
FAYE, Prof., on the numerical proportion of male and female births in Norway and Russia, i. 291; on the greater mortality of male children at and before birth, i. 292.
FEATHERS, modified, producing sounds, ii. 60; *et seqq.*, 156; elongated, in male birds, ii. 69, 93; racket-shaped, ii. 70; barbless and with filamentous barbs in certain birds, ii. 70; shedding of margins of, ii. 82.
FEEDING, high, probable influence of, in the pairing of birds of different species, ii. 111.
FEET, modification of, in man, i. 136; thickening of the skin on the soles of the, i. 113.
Felis Canadensis, throat-ruff of, ii. 273.
Felis pardalis and *F. mitis*, sexual differences in the coloring of, ii. 273.
FEMALE, behavior of the, during courtship, i. 264.
FEMALE birds, differences of, ii. 185.
FEMALES, presence of rudimentary male organs in, i. 199; preference of, for certain males, i. 254; pursuit of, by males, i. 263; occurrence of secondary sexual characters in, i. 267; development of male characters by, i. 271.
FEMALES and males, comparative mortality of, while young, i. 255, 267; comparative numbers of, i. 252, 255.
FEMUR and tibia, proportions of, in the Aymara Indians, i. 115.
FERGUSON, Mr., on the courtship of fowls, ii. 113.
FERTILIZATION, phenomena of, in plants, i. 265; in the lower animals, i. 266.
FEVERS, immunity of Negroes and Mulattoes from, i. 234.
Fiber zibethicus, protective coloring of, ii 284.
FIDELITY of savages to one another, i. 91 importance of, i. 156.
FIELD-SLAVES, difference of, from house-slaves, i. 237.
FIJIANS, burying their old and sick parents alive, i. 74; estimation of the beard among the, ii. 333; admiration of, for a broad occiput, ii. 335.
FIJI Islands, beards of the natives, ii. 306, 333; marriage-customs of the, ii. 356.
FILIAL affection, partly the result of natural selection, i. 77.
FILUM terminale, i. 29.
FINCH, racket-shaped feathers in the tail of a, ii. 70.
FINCHES, spring change of color in, ii. 82; British females of the, ii. 185.
FINGERS, partially coherent, in species of *Hylobates*, i. 134.
FINLAYSON, on the Cochin-Chinese, ii. 329,
FIRE, use of, i. 132, 176, 225.
FISCHER, on the pugnacity of the male of *Lethrus cephalotes*, i. 365.
FISH, proportion of the sexes in, i. 298; eagerness of male, i. 263.
FISHES, kidneys of, represented by Corpora Wolffiana in the human embryo, i. 16; male, hatching ova in their mouths, i. 202; receptacles for ova possessed by, i. 246; relative size of the sexes in, ii. 7; fresh-water, of the tropics, ii. 17; protective resemblances in, ii. 18; nest-building, ii. 19; spawning of, ii. 18; sounds produced by, ii. 22, 315; continued growth of, ii. 207.
Flexor pollicis longus, similar variation of, in man, i. 124.
FLINT tools, i. 176.
FLINTS, difficulty of chipping into form, i. 133.
FLORIDA, *Quiscalus major* in, i. 298.
FLOUNDER, coloration of the, ii, 18.
FLOWER, W. H., on the abductor of the fifth metatarsal in apes, i. 123; on the position of the Seals, i. 183; on the throat-pouch of the male Bustard, ii. 55.
FLY-CATCHERS, colors and nidification of, ii. 162.
FŒTUS, human, woolly covering of the, i. 25; arrangement of the hair on, i. 186.
FOOD, influence of, upon stature, i. 110.
FOOT, prehensile, in the early progenitors of man, i. 198; prehensile power of the, retained in some savages, i. 136.
FORAMEN, supra-condyloid, exceptional occurrence of, in the humerus of man, i. 27, 125; in the early progenitors of man, i. 198.
FORBES, D., on the Aymara Indians, i. 115; on local variation of color in the Quechuas, i. 237; on the hairlessness of the Aymaras and Quechuas, ii. 307; on the long hair of the Aymaras and Quechuas, ii. 305, 331.
FOREL, F., on white young swans, ii. 202.

Formica rufa, size of the cerebral ganglia in, i. 139.

Fossils, absence of, connecting man with the apes, i. 193.

Fowl, occurrence of spurs in the female, i. 271; game, early pugnacity of, i. 285; Polish, early development of cranial peculiarities of, i. 285; variations in plumage of, ii. 71; examples of correlated development in the, ii. 124; domestic, breeds and subbreeds of, ii. 168.

Fowls, spangled Hamburg, i. 272, 284; sexual peculiarities in, transmitted only to the same sex, i. 274; loss of secondary sexual characters by male, i. 275; inheritance of changes of plumage by, i. 272; Polish origin of the crest in, i. 275; period of inheritance of characters by, i. 284; cuckoo-, i. 285; development of the comb in, i. 285; numerical proportion of the sexes in, i. 296; courtship of, ii. 112; mongrel, between a black Spanish cock and different hens, ii. 125; pencilled Hamburg, difference of the sexes in, ii. 151; Spanish, sexual differences of the comb in, ii. 151; spurred, in both sexes, ii. 155.

Fox, W. D., on some half-tamed wild-ducks becoming polygamous, and on polygamy in the guinea-fowl and canary-bird, i. 261; on the proportion of the sexes in cattle, i. 295; on the pugnacity of the peacock, ii. 43; on a nuptial assembly of magpies, ii. 98; on the finding of new mates by crows, ii. 100; on partridges living in triplets, ii. 103; on the pairing of a goose with a Chinese gander, ii. 110.

Foxes, wariness of young in hunting districts, i. 48; black, ii. 280.

France, numerical proportion of male and female births in, i. 292.

Francesco, B., on the Simian resemblances of man, i. 4.

Fraser, C., on the different colors of the sexes in a species of *Squilla*, i. 326.

Fringilla cannabina, ii. 82.

Fringilla ciris, age of mature plumage in, ii. 204.

Fringilla cyanea, age of mature plumage in, ii. 204.

Fringilla leucophrys, young of, ii. 208.

Fringilla spinus, ii. 110.

Fringilla tristis, change of color in, in spring, ii. 82; young of, ii. 207,

Fringillidæ, resemblance of the females of distinct species of, ii. 184.

Frogs, ii. 24; male, temporary receptacles for ova possessed by, i. 246; ready to breed before the females, i. 252; vocal organs of, ii. 28.

Frontal bone, persistence of the suture in, i. 120.

Fruits, poisonous, avoided by animals, i. 85.

Fuegians, i. 160, 174; mental capacity of the, i. 33; quasi-religious sentiments of the, i. 65; power of sight in the, i. 114; skill of, in stone-throwing, i. 156; resistance of the, to their severe climate, i. 150, 229; difference of stature among the, i. 111; mode of life of the, i. 237; resemblance of, in mental characters, to Europeans, i. 223; aversion of, to hair on the face, ii. 332; said to admire European women, ii. 334.

Fulgoridæ, songs of the, i. 340.

Fur, whiteness of, in arctic animals, in winter, i. 273.

Fur-bearing animals, acquired sagacity of, i. 48.

G.

Gallicrex, sexual difference in the color of the irides in, ii. 123.

Gallicrex cristatus, red caruncle occurring in the male during the breeding-season, ii. 76.

Gallinaceæ, frequency of polygamous habits and of sexual differences in the, i. 260; love-gestures of, ii. 65; decomposed feathers in, ii. 70; stripes of young, ii. 176; comparative sexual differences between the species of, ii. 184, 185; plumage of, ii. 187.

Gallinaceous birds, weapons of the male, ii. 42; racket-shaped feathers on the heads of, ii. 70.

Gallinula chloropus, pugnacity of male, ii. 38.

Gallinula cristata, pugnacity of the male, ii. 39.

Galloperdix, spurs of, ii. 44; development of spurs in the female, ii. 155.

Gallophasis, young of, ii. 182.

Gallus bankiva, ii. 151; neck-hackles of, ii. 81.

Gallus Stanleyi, pugnacity of the male, ii. 42.

Galls, i. 146.

Galton, Mr., on the struggle between the social and personal impulses, i. 99; on hereditary genius, i. 106; on the effects of natural selection on civilized nations, i. 161; on the sterility of sole daughters, i. 164; on the degree of fertility of people of genius, i. 165; on the early marriages of the poor, i. 167; on the ancient Greeks i. 171; on the Middle Ages, i. 171; on the progress of the United States, i. 172; on South African notions of beauty, ii. 331.

Gammarus, use of the chelæ of, i. 331.

Gammarus marinus, i. 323.

Gannets, white only when mature, ii. 218.

Ganoidei, i. 196.

Ganoid fishes, i. 204.

Gaour, horns of the, ii. 236.

Gap between man and the apes, i. 192.

Gaper, sexes and young of, ii. 208.

Gardner, on an example of rationality in a *Gelasimus*, i. 324.

Garrulus glandarius, ii. 100.

Gärtner, on sterility of hybrid plants, i. 215.

GASTEROPODA, i. 315; pulmoniferous, courtship of, i. 315.
Gasterosteus, i. 209; nidification of, ii. 19.
Gasterosteus leiurus, ii. 2, 14, 19.
Gasterosteus trachurus, ii. 2.
Gastrophora, wings of, brightly colored beneath, i. 384.
GAUCHOS, want of humanity among the, i. 97.
GAUDRY, M., on a fossil monkey, i. 189.
Gavia, seasonal change of plumage in, ii. 218.
GEESE, clanging noise made by, ii. 49; pairing of different species of, ii. 109; Canada, selection of mates by, ii. 112.
GEGENBAUR, C., on the number of digits in the Ichthyopterygia, i. 120; on the hermaphroditism of the remote progenitors of the vertebrata, i. 199.
Gelasimus, use of the enlarged chela of the male, i. 322; pugnacity of males of, i. 323; proportions of the sexes in a species of, i. 307; rational actions of a, i. 325; difference of color in the sexes of a species of, i. 327.
GEMMULES, sexual selection of, i. 297.
GENESIS, i. 310.
GENIUS, ii. 312; hereditary, i. 106.
GENIUS, fertility of men and women of, i. 165.
GEOFFROY SAINT-HILAIRE, Isid., on the recognition of women by male quadrumana, i. 13; on the occurrence of a rudimentary tail in man, i. 28; on monstrosities, i. 108; on animal-like anomalies in the human structure, i. 120; on the correlation of monstrosities, i. 125; on the distribution of hair in man and monkeys, i. 143; on the caudal vertebræ of monkeys, i. 144; on correlated variability, i. 146; on the classification of man, i. 179; on the long hair on the heads of species of *Semnopithecus*, i. 184; on the hair in monkeys, i. 186; on the development of horns in female deer, ii. 233; and F. Cuvier, on the mandrill, ii. 278; on Hylobates, ii. 303, 305.
GEOGRAPHICAL distribution, as evidence of specific distinctions in man, i. 210.
GEOMETRÆ, brightly colored beneath, i. 385.
Geophagus, frontal protuberance of male, ii. 13, 20; eggs hatched by the male, in the mouth or branchial cavity, ii. 192.
GEORGIA, change of color in Germans settled in, i. 237.
Geotrupes, stridulation of, i. 369, 370.
GERBE, M., on the nest-building of *Crenilabrus massa* and *C. melops*, ii. 19.
GERLAND, Dr., on the prevalence of infanticide, i. 90; ii. 328, 348; on the extinction of races, i. 228, 229.
GERVAIS, P., on the hairiness of the gorilla, i. 143; on the mandrill, ii. 278.
GESTURE-LANGUAGE, i. 224.
GHOST-MOTH, sexual difference of color in the, i. 386, 390.
GIBB, Sir D., on differences of the voice in different races of men, ii. 315.
GIBBON, Hoolock, nose of, i. 184.
GIBBONS, voice of, ii. 263.
GIRAFFE, mute, except in the rutting season, ii. 261; its mode of using the horns, ii. 239.
GIRAUD-TEULON, on the cause of short sight, i. 114.
GLANDERS, communicable between man and the lower animals, i. 11.
GLANDS, odoriferous, in mammals, ii. 266, 267.
Glareola, double moult in, ii. 77.
Glomeris limbata, difference of color in the sexes of, i. 331.
GLOWWORM, female, apterous, i. 247; luminosity of the, i. 335.
GNATS, dances of, i. 339.
GNU, sexual differences in the color of the, ii. 275.
GOAT, male, wild, falling on his horns, ii. 238; male, odor emitted by, ii. 266; male, wild, crest of the, ii. 268; Berbura, mane, dewlap, etc., of the male, ii. 271; Kemas, sexual difference in the color of the, ii. 275.
GOATS, sexual differences in the horns of, i. 274; horns of, i. 280, ii. 235; domestic, sexual differences of, late developed, i. 293; beards of, ii. 269; mode of fighting of, ii. 238, 239.
GOATSUCKER, Virginian, pairing of the, ii. 47.
GOBIES, nidification of, ii. 19.
GOD, want of the idea of, in some races of men, i. 62.
GODRON, M., on variability, i. 108; on difference of stature, i. 111; on the want of connection between climate and the color of the skin, i. 232; on the odor of the skin, i. 239; on the color of infants, ii. 303.
GOLDFINCH, ii. 53, 79; proportion of the sexes in the, i. 298; sexual differences of the beak in the, ii. 37; courtship of the, ii. 91.
GOLDFINCH, North American, young of, ii. 207.
GOLD-FISH, ii. 16.
Gomphus, proportions of the sexes in, i. 316; difference in the sexes of, i. 351.
Gonepteryx Rhamni, i. 380; sexual difference of color in, i. 396.
GOODSIR, Prof., on the affinity of the lancelet to the ascidians, i. 196.
GOOSANDER, young of, ii. 181.
GOOSE, Antarctic, colors of the, ii. 218.
GOOSE, Canada, pairing with a Bernicle gander, ii. 109.
GOOSE, Chinese, knob on the beak of the, ii. 124.
GOOSE, Egyptian, ii. 44.
GOOSE, Sebastopol, plumage of, ii. 69.
GOOSE, Snow-, whiteness of the, ii. 218.
GOOSE, Spur-winged, ii. 44.
GORILLA, ii. 308; semi-erect attitude of the, i. 137; mastoid processes of the, i. 138, direction of the hair on the arms of the, i. 185; supposed evolution of the, i.

222; polygamy of the, i. 258, ii. 345, 346; voice of the, ii. 262; cranium of, ii. 303; fighting of male, ii. 309.

Gosse, P. H., on the pugnacity of the male Humming-birds, ii. 38.

Gosse, M., on the inheritance of artificial modifications of the skull, ii. 364.

Gould, B. A., on variation in the length of the legs in man, i. 104; measurements of American soldiers, i. 110, 112; on the proportions of the body and capacity of the lungs in different races of men, i. 208; on the inferior vitality of mulattoes, i. 213.

Gould, J., on the arrival of male snipes before the females, i. 251; on the numerical proportion of the sexes in birds, i. 297; on *Neomorpha*, ii. 37; on the species of *Eustephanus*, ii. 37; on the Australian Musk-duck, ii. 37; on the relative size of the sexes in *Biziura lobata* and *Cincloramphus cruralis*, ii. 41; on *Lobivanellus lobatus*, ii. 46; on the habits of *Menura Alberti*, ii. 53; on the rarity of song in brilliant birds, ii. 55; on *Selasphorus platycercus*, ii. 62; on the Bower-birds, ii. 66, 98; on the ornamental plumage of the Humming-birds, ii. 75; on the moulting of the ptarmigan, ii. 79; on the display of plumage by the male Humming-birds, ii. 82; on the shyness of adorned male birds, ii. 93; on the decoration of the bowers of Bower-birds, ii. 107; on the decoration of their nests by Humming-birds, ii. 107; on variation in the genus *Cynanthus*, ii. 121; on the color of the thighs in a male parakeet, ii. 121, on *Urosticte Benjamini*, ii. 145, 146; on the nidification of the Orioles, ii. 160; on obscurely-colored birds building concealed nests, ii. 161; on Trogons and Kingfishers, ii. 165; on Australian parrots, ii. 166; on Australian pigeons, ii. 167; on the moulting of the ptarmigan, ii. 173; on the immature plumage of birds, ii. 178 *et seq.;* on the Australian species of *Turnix*, ii. 192; on the young of *Aithurus polytmus*, ii. 211; on the colors of the bills of Toucans, ii. 217; on the relative size of the sexes in the Marsupials of Australia, ii. 248; on the colors of the Marsupials, ii. 272.

Goureau, on the stridulation of *Mutilla Europœa*, i. 355.

Gout, sexually transmitted, i. 283.

Graba, on the Pied Ravens of the Feroe Islands, ii. 121; on the Bridled Guillemot, ii. 122.

Gradation of secondary sexual characters in birds, ii. 129.

Grallatores, absence of secondary sexual characters in, i. 261; double moult in some, ii. 77.

Grallina, nidification of, ii. 161.

Grasshoppers, stridulation of the, i. 346.

Gratiolet, Prof., on the anthropomorphous apes, i. 189; on the evolution of the anthropomorphous apes, i. 227.

Gray, Asa, on the gradation of species among the Compositæ, i. 219.

Gray, J. E., on the caudal vertebræ of monkeys, i. 145; on the presence of rudiments of horns in the female of *Cervulus moschatus*, ii. 234; on the horns of goats and sheep, ii. 235; on the beard of the Ibex, ii. 269; on the Berbura goat, ii. 271; on sexual differences in the coloration of Rodents, ii. 272; on the colors of the Elands, ii. 274; on the Sing-sing antelope, ii. 275; on the colors of goats, ii. 276; on the Hog-deer, ii. 289.

"Greatest happiness principle," i. 93, 94.

Greeks, ancient, i. 171.

Green, A. H., on beavers fighting, ii. 228; on the voice of the beaver, ii. 263.

Greenfinch, selected by a female canary, ii. 110.

Greg, W. R., on the early marriages of the poor, i. 167; on the ancient Greeks, i. 171; on the effects of natural selection on civilized nations, i. 161.

Grenadiers, Prussian, i. 108.

Grey, Sir G., on female infanticide in Australia, ii. 348.

Greyhounds, numerical proportion of the sexes in, i. 255, 256; numerical proportion of male and female births in, i. 294.

Grouse, red, monogamous, i. 261; pugnacity of young male, ii. 46; producing a sound by scraping their wings upon the ground, ii. 59; duration of courtship of, ii. 96; colors and nidification of, ii. 163.

Grube, Dr., on the occurrence of the supra-condyloid foramen in the humerus of man, i. 27.

Grus Americanus, age of mature plumage in, ii. 204; breeding in immature plumage, ii. 205.

Grus virgo, trachea of, ii. 57.

Gryllus campestris, i. 343; pugnacity of male, i. 349.

Gryllus domesticus, i. 343.

Grypus, sexual differences in the beak in, ii. 37.

Guanacoes, battles of, ii. 228; canine teeth of, ii. 246.

Guanas, strife for women among the, ii. 309; polyandry among the, ii. 349.

Guanche skeletons, occurrence of the supra-condyloid foramen in the humerus of, i. 28.

Guaranys, proportion of men and women among, i. 292; color of new-born children of the, ii. 303; beards of the, ii. 307.

Guenée, A., on the sexes of *Hyperythra*, i. 301.

Guilding, L., on the stridulation of the *Locustidæ*, i. 342.

Guillemot, variety of the, ii. 122.

Guinea, sheep of, with males only horned, i. 280.

Guinea-fowl, monogamous, i. 361; occasional polygamy of the, i. 261; markings of the, ii. 129.

Guinea-pigs, inheritance of the effects of operations by, ii. 363.

Gull, instance of reasoning in a, ii. 104.

Gulls, seasonal change of plumage in, ii. 218; white, ii. 218.

Günther, Dr., on hermaphroditism in *Serranus*, i. 200; on male fishes hatching ova in their mouths, i. 201, ii. 19; on mistaking infertile female fishes for males, i. 298; on the prehensile organs of male Plagiostomous fishes, ii. 2; on the pugnacity of the male salmon and trout, ii. 3; on the relative size of the sexes in fishes, ii. 7; on sexual differences in fishes, ii. 8 *et seqq.;* on the genus *Callionymus*, ii. 9; a protective resemblance in a Pipe-fish, ii. 18; on the genus *Solenostoma*, ii. 21; on *Megalophrys montana*, ii. 25; on the coloration of frogs and toads, ii. 25; on sexual differences in the Ophidia, ii. 72; on differences of the sexes of lizards, ii. 30 *et seqq.*

Gynanisa Isis, ocellated spots of, ii. 127.

Gypsies, uniformity of, in various parts of the world, i. 233.

H.

Habits, bad, facilitated by familiarity, i. 97; variability of the force of, i. 176.

Häckel, E., on the origin of man, i. 4; on rudimentary characters, i. 17; on the canine teeth in man, i. 121; on death caused by inflammation of the vermiform appendage, i. 27; on the steps by which man became a biped, i. 136; on man as a member of the Catarrhine group, i. 191; on the position of the Lemuridæ, i. 194; on the genealogy of the Mammalia, i. 195; on the lancelet, i. 196; on the transparency of pelagic animals, i. 314; on the musical powers of women, ii. 321.

Hagen, H., and Walsh, B. D., on American neuroptera, i. 306.

Hair, development of, in man, i. 24; character of, supposed to be determined by light and heat, i. 111; tribution of, in man, i. 144, ii. 359; possibly removed for ornamental purposes, i. 143; arrangement and direction of, i. 185; of the early progenitors of man, i. 198; different texture of, in distinct races, i. 208; and skin, correlation of color of, i. 238; development of, in mammals, ii. 268; management of, among different peoples, ii. 324; great length of, in some North American tribes, ii. 331; elongation of the, on the human head, ii. 365.

Hairiness, difference of, in the sexes in man, ii. 305; variation of, in races of men, ii. 306.

Hairs and excretory pores, numerical relation of, in sheep, i. 239.

Hairy family, Siamese, ii. 361.

Hamadryas baboon, turning over stones, i. 72; mane of the male, ii. 255.

Hamilton, C., on the cruelty of the Kaffres to animals, i. 91; on the engrossment of the women by the Kaffre chiefs, ii. 352.

Hammering, difficulty of, i, 133.

Hancock, A., on the colors of the nudibranch mollusca, i. 317.

Hands, larger at birth, in the children of laborers, i. 113; structure of, in the quadrumana, i. 134; and arms, freedom of, indirectly correlated with diminution of canines, i. 138.

Handwriting, inherited, i. 56.

Harcourt, E. Vernon, on *Fringilla cannabina*, ii. 82.

Harelda glacialis, ii. 117.

Hare, protective coloring of the, ii. 284.

Hares, battles of male, ii. 228.

Harlan, Dr., on the difference between field and house slaves, i. 237.

Harris, J. M., on the relation of complexion to climate, i. 236.

Harris, T. W., on the Katy-did locust, i. 342; on the stridulation of the grasshoppers, i. 346; on *Œcanthus nivalis*, i. 350; on the coloring of Lepidoptera, i. 383; on the coloring of *Saturnia Io*, i. 383.

Harry-long-legs, pugnacity of male, i. 339.

Hartman, Dr., on the singing of *Cicada septendecem*, i. 340.

Haughton, S., on a variation of the *flexor pollicis longus* in man, i. 124.

Hawks, feeding orphan nestling, ii. 103.

Hayes, Dr., on the diverging of sledge-dogs on thin ice, i. 45.

Head, altered position of, to suit the erect attitude of man, i. 138; hairiness of in man, i, 142; processes of, in male beetles, i. 357; artificial alterations of the form of the, ii. 335.

Hearne, on strife for women among the North American Indians, ii. 308; on the North American Indians' notion of female beauty, ii. 328; repeated elopements of a North American woman, ii. 356.

Heart, in the human embryo, i. 16.

Heat, supposed effects of, i. 111.

Hectocotyle, i. 316.

Hedge-warbler, ii. 189; young of the, ii. 200.

Heel, small projection of, in the Aymara Indians, i. 115.

Hegt, M., on the development of the spurs in peacocks, i. 281.

Heliconidæ, i. 375; mimicry of, by other butterflies, i. 393.

Heliopathes, stridulation peculiar to the male, i. 371.

Heliothrix auriculata, young of, ii. 180 181.

Helix pomatia, example of individual attachment in, i. 316.

Hellins, J., proportions of sexes of Lepidoptera reared by, i. 304.

Helmholtz, on the vibration of the auditory hairs of crustacea, ii. 317.

HEMIPTERA, i. 339.

Hemitragus, beardless in both sexes, ii. 269.

HEPBURN, Mr., on the autumn-song of the water-ouzel, ii. 51.

Hepialus humuli, sexual difference of color in the, i. 386, 390.

HERBS, poisonous, avoided by animals, i. 36.

HERMAPHRODITISM of embryos. i. 199.

Herodias bubulcus, vernal moult of, ii. 80.

HERON, love-gestures of a, ii. 65.

HERON, Sir R., on the habits of peafowl, ii. 115, 116, 146.

HERONS, decomposed feathers in, ii. 70; breeding-plumage of, ii. 78, 79; young of the, ii. 200; sometimes dimorphic, ii. 205; continued growth of crest and plumes in the males of some, ii. 206; change of color in some, ii. 221.

Hetærina, difference in the sexes of, i. 351; proportion of the sexes in. i. 306.

Heterocerus, stridulation of, i. 368.

HEWITT, Mr., on a game-cock killing a kite, ii. 41; on the recognition of dogs and cats by ducks, ii. 106; on the pairing of a wild-duck with a pintail drake, ii. 110; on the courtship of fowls, ii. 112; on the coupling of pheasants with common hens, ii. 117.

HINDOO, his horror of breaking his caste, i. 95, 98.

HINDOOS, local difference of stature among, i. 111; difference of, from Europeans, i. 231; color of the beard in, ii. 304.

Hipparchia Janira, instability of the ocellated spots of, ii. 127.

Hipparchiæ, i. 375.

Hippocampus, development of, i. 202; marsupial receptacles of the male, ii. 20.

HIPPOPOTAMUS, nakedness of, i. 142.

HIPS, proportions of, in soldiers and sailors, i. 112.

HODGSON, S., on the sense of duty, i. 68.

HOFFBERG, on the horns of the reindeer, ii. 233; on sexual preferences shown by reindeer, ii. 260.

HOG, wart, ii. 253; river, ii. 254.

HOG-DEER, ii. 289.

HOLLAND, Sir H., on the effects of new diseases, i. 230.

HOMOLOGOUS structures, correlated variation of, i. 125.

HOMOPTERA, i. 340; stridulation of the, and orthoptera, discussed, i. 349.

HONDURAS, *Quiscalus major* in, i. 298.

HONEY-BUZZARD of India, variation in the crest of, ii. 121.

HONEY-SUCKERS, moulting of the, ii. 79; Australian, nidification of, ii. 161.

HONOR, law of, i. 95.

HOOKER, Jos., on the color of the beard in man, ii. 304.

HOOLOCK GIBBON, nose of, i. 184.

HOOPOE, ii. 53; sounds produced by the male, ii. 60.

Hoplopterus armatus, wing-spurs of, ii. 46.

HORNBILL, African, inflation of the neck-wattle of the male during courtship, ii. 69.

HORNBILLS, sexual difference in the color of the eyes in, ii. 123; nidification and incubation of, ii. 161.

HORNE, C., on the rejection of a brightly-colored locust by lizards and birds, i. 351.

HORNS, of deer, ii. 232, 237, 248; and canine teeth, inverse development of, ii. 245 sexual differences of, in sheep and goats, i. 273; loss of, in female merino sheep, i 275; development of, in deer, i. 278; development of, in antelopes, i. 280; from the head and thorax, in male beetles, i. 357.

HORSE, polygamous, i. 258; canine teeth of male, ii. 230; winter change of the, ii. 284; fossil, extinction of the, in South America, i. 231.

HORSES, dreaming, i. 44; rapid increase of, in South America, i. 130; diminution of canine teeth in, i. 138; of the Falkland Islands and pampas, i. 227; numerical proportion of the sexes in, i. 255. 256; lighter in winter in Siberia, i. 273; sexual preferences in, ii. 260; pairing preferently with those of the same color, ii. 281; numerical proportion of male and female births in, i. 293; formerly striped, ii. 291.

HOTTENTOT women, peculiarities of, i. 217.

HOTTENTOTS, lice of, i. 212; readily become musicians, ii. 318; notions of female beauty of the, ii. 329; compression of nose by, ii. 335.

HOUSE-SLAVES, difference of, from field-slaves, i. 237.

HUBER, P., on ants playing together, i. 38; on memory in ants, i. 44; on the intercommunication of ants, i. 56; on the recognition of each other by ants after separation, i. 354.

HUC, on Chinese opinions of the appearance of Europeans, ii. 328.

HUMAN kingdom, i. 179.

HUMAN sacrifices, i. 66.

HUMANITY, unknown among some savages, i. 91; deficiency of, among savages, i. 97.

HUMBOLDT, A. von, on the rationality of mules, i. 47; on a parrot preserving the language of a lost tribe, i. 228; on the cosmetic arts of savages, ii. 324; on the exaggeration of natural characters by man, ii. 334; on the red painting of American Indians, ii. 336.

HUME, D., on sympathetic feelings, i. 81.

HUMMING-BIRD, racket-shaped feathers in the tail of a, ii. 70; display of plumage by the male, ii. 83.

HUMMING-BIRDS, ornament their nests, i. 63, ii. 107; polygamous, i. 260; proportion of the sexes in, i. 298, ii. 213; sexual differences in, ii. 37, 38, 145; pugnacity of male, ii. 38; modified primaries of male, ii. 62; coloration of the sexes of ii. 75; young of, ii. 211; nidification of the, ii. 160; colors of female, ii. 160.

Humphreys, H. N., on the habits of the Stickle-back, i. 262, ii. 2.
Hunger, instinct of, i. 86.
Huns, ancient, flattening of the nose by the, ii. 325.
Hunter, J., on the number of species of man, i. 218; on secondary sexual characters, i. 245; on the general behavior of female animals during courtship, i. 264; on the muscles of the larynx in song-birds, ii. 52; on the curled frontal hair of the Bull, ii. 269; on the rejection of an ass by a female zebra, ii. 281.
Hunter, W. W., on the recent rapid increase of the Santali, i. 128; on the Santali, i. 232.
Hussey, Mr., on a partridge distinguishing persons, ii. 105.
Hutchinson, Colonel, example of reasoning in a retriever, i. 46.
Hutton, Captain, on the male wild-goat falling on his horns, ii. 238.
Huxley, T. H., on the structural agreement of man with the apes, i. 3; on the agreement of the brain in man with that of lower animals, i. 10; on the adult age of the Orang, i. 13; on the embryonic development of man, i. 14; on the origin of man, i. 4, 17; on variation in the skulls of the natives of Australia, i. 104; on the abductor of the fifth metatarsal in apes, i. 123; on the position of man, i. 183; on the sub-orders of primates, i. 187; on the Lemuridæ, i. 194; on the Dinosauaria, i. 196; on the amphibian affinities of the Ichthyosaurians, i. 196; on variability of the skull in certain races of man, i. 218; on the races of man, i. 219.
Hybrid birds, production of, ii. 109.
Hydrophobia communicable between man and the lower animals, i. 11.
Hydroporus, dimorphism of females of, i. 333.
Hyelaphus porcinus, ii. 289.
Hygrogonus, ii. 20.
Hyla, singing species of, ii. 25.
Hylobates, maternal affection in a, i. 39; absence of the thumb in, i. 135; upright progression of some species of, i. 137; direction of the hair on the arms of species of, i. 185; females of, less hairy below than males, ii. 305.
Hylobates agilis, i. 135; hair on the arms of, i. 185; musical voice of the, ii. 264; superciliary ridge of, ii. 303; voice of, ii. 316.
Hylobates hoolock, sexual difference of color in, ii. 277.
Hylobates lar, i. 135; hair on the arms of, i. 185.
Hylobates leuciscus, i. 135.
Hylobates syndactylus, i. 135; laryngeal sac of, ii. 263.
Hymenoptera, i. 353; large size of the cerebral ganglia in, i. 139; classification of, i. 181; sexual differences in the wings of, i. 335; aculeate, relative size of the sexes of, i. 337.
Hymenopteron, parasitic, with a sedentary male, i. 264.
Hyomoschus aquaticus, ii. 289.
Hyperythra, proportion of the sexes in, i. 301.
Hypogymna dispar, sexual difference of color in, i. 386.
Hypopyra, coloration of, i. 384.

I.

Ibex, male, falling on his horns, ii. 238; beard of the, ii. 269.
Ibis, scarlet, young of the, ii. 199; white, change of color of naked skin in, during the breeding-season, ii. 76.
Ibis tantalus, age of mature plumage in, ii. 204; breeding in immature plumage, ii. 205, 206.
Ibises, decomposed feathers in, ii. 71; white, ii. 218, and black, ii. 220.
Ichneumonidæ, difference of the sexes in, i. 354.
Ichthyopterygia, 120.
Ichthyosaurians, ii. 196.
Ideas, general, i. 60.
Idiots, microcephalous, imitative faculties of, i. 55; microcephalous, their characters and habits, i. 116.
Iguana tuberculata, ii. 31.
Iguanas, ii. 30.
Illegitimate and legitimate children, proportion of the sexes in, i. 292.
Imagination, existence of, in animals, i. 44.
Imitation, i. 38; of man by monkeys, i. 42; tendency to, in monkeys, microcephalous idiots and savages, i. 55; influence of, i. 155.
Immature plumage of birds, ii. 175, 179.
Implacentata, i. 194.
Implements, employed by monkeys, i. 49; fashioning of, peculiar to man, i. 51.
Impregnation, period of, influence of, upon sex, i. 293.
Improvement, progressive, man alone supposed to be capable of, i. 48.
Incisor teeth, knocked out or filed by some savages, ii. 324.
Increase, rate of, i. 126; necessity of checks in, i. 130.
Indecency, hatred of, a modern virtue, i. 92.
India, difficulty of distinguishing the native races of, i. 207; Cyprinidæ of, ii. 17; color of the beard in races of men of, ii. 304.
Indian, North American, honored for scalping a man of another tribe, i. 90.
Individuality, i. 60.
Individuation, i. 310.
Indopicus carlotta, colors of the sexes of, ii. 167.
Infanticide, prevalence of, i. 90, 129; supposed cause of, ii. 328; prevalence and causes of, ii. 347, *et seq.*
Inferiority, supposed physical, of man, i 150.

Inflammation of the bowels, occurrence of, in *Cebus Azaræ*, i. 12.

Inheritance, i. 106; of effects of use of vocal and mental organs, i. 56; of moral tendencies, i. 98, 100; of long and short sight, i. 114; laws of, i. 270; sexual, i. 276; sexually limited, ii. 147.

Inquisition, influence of the, i. 172.

Insanity, hereditary, i. 107.

Insect, fossil, from the Devonian, i. 349.

Insectivora, ii. 272; absence of secondary sexual characters in, i. 259.

Insects, relative size of the cerebral ganglia in, i. 139; male, appearance of, before the females, i. 252; pursuit of female, by the males, i. 268; period of development of sexual characters in, i. 282; secondary sexual characters of, i. 331; stridulation of, ii. 315.

Insessores, vocal organs of, ii. 52.

Instep, depth of, in soldiers and sailors, i. 112.

Instinct and intelligence, i. 36.

Instinct, migratory, vanquishing the maternal, i. 80, 81.

Instinctive actions, the result of inheritance, i. 77.

Instinctive impulses, difference of the force of, i. 83, 85; and moral impulses, alliance of, i. 84.

Instincts, i. 35; complex origin of, through natural selection, i. 37; possible origin of some, i. 37; acquired, of domestic animals, i. 76; variability of the force of, i. 79; difference of force between the social and other, i. 85, 99; utilized for new purposes, ii. 319.

Instrumental music of birds, ii. 59, 64.

Intellect, influence of, in natural selection in civilized society, i. 164.

Intellectual faculties, their influence on natural selection in man, i. 152; probably perfected through natural selection, i. 154.

Intelligence, Mr. H. Spencer on the dawn of, i. 36.

Intemperance, no reproach among savages, i. 92; its destructiveness, i. 166.

Intoxication in monkeys, i. 12.

Iphius glaucippe, i. 381.

Iris, sexual difference in the color of the, in birds, ii. 69, 123.

Ischio-pubic muscle, i. 122.

Ithaginis cruentus, number of spurs in, ii. 44.

Iulus, tarsal suckers of the males of, i. 330.

J.

Jackals learning to bark from dogs, i. 43.

Jack-snipe, coloration of the, ii. 216.

Jacquinot, on the number of species of man, i. 218.

Jaeger, Dr., on the difficulty of approaching herds of wild animals, i. 71; on the increase of length in bones, i. 112; on the deposition of a male Silver-pheasant on account of a spoiled plumage, ii. 115.

Jaguars, black, ii. 280.

Janson, E. W., on the proportions of the sexes in *Tomicus villosus*, i. 305; on stridulant beetles, i. 367.

Japan, encouragement of licentiousness in, i. 129.

Japanese, general beardlessness of the, ii. 306; aversion of the, to whiskers, ii. 332.

Jardine, Sir W., on the Argus pheasant, ii. 69, 93.

Jarrold, Dr., on modifications of the skull induced by unnatural position, i. 141.

Javanese, relative height of the sexes of, ii. 305; notions of female beauty, ii. 331.

Jaw, influence of the muscles of the, upon the physiognomy of the apes, i. 138.

Jaws, smaller in the same ratio with the extremities, i. 113; influence of food upon the size of, i. 113; diminution of, in man, i. 138; in man, reduced by correlation, ii. 309.

Jay, young of the, ii. 200; Canada, young of the, ii. 200.

Jays, new mates found by, ii. 100; distinguishing persons, ii. 105.

Jeffreys, J. Gwyn, on the form of the shell in the sexes of the Gasteropoda, i. 315; on the influence of light upon the colors of shells, i. 317.

Jelly-fish, bright colors of some, i. 313.

Jenner, Dr., on the voice of the rook, ii. 58; on the finding of new mates by magpies, ii. 99; on retardation of the generative organs in birds, ii. 103.

Jenyns, L., on the desertion of their young by swallows, i. 80; on male birds singing after the proper season, ii. 103.

Jerdon, Dr., on birds dreaming, i. 44; on the pugnacity of the male bulbul, ii. 39; on the pugnacity of the male *Ortygornis gularis*, ii. 42; on the spurs of *Galloperdix*, ii. 44; on the habits of *Lobivanellus*, ii. 46; on the spoonbill, ii. 57; on the drumming of the Kalij-pheasant, ii 60; on Indian bustards, ii. 62; on *Otis Bengalensis*, ii. 66; on the ear-tufts of *Sypheotides auritus*, ii. 70; on the double moults of certain birds, ii. 79; on the moulting of the honey-suckers, ii. 79; on the moulting of bustards, plovers, and drongos, ii. 80; on display in male birds, ii. 82; on the spring change of color in some finches, ii. 82; on the display of the under tail-coverts by the male bulbul, ii. 91; on the Indian honey-buzzard, ii. 121; on sexual differences in the color of the eyes of hornbills, ii. 123; on the markings of the Tragopan pheasant, ii. 128; on the nidification of the Orioles, ii. 160; on the nidification of the hornbills, ii. 161; on the Sultan yellow-tit, ii. 167; on *Palæornis Javanicus*, ii. 172; on the immature plumage of birds, ii. 178, *et seq.*; on representative species of birds, ii. 182; on the habits of *Turnix*, ii. 193

on the continued increase of beauty of the peacock, ii. 207; on coloration in the genus *Palæornis*, ii. 221.

Jevons, W. S., on the migrations of man, i. 130.

Jews, ancient use of flint tools by the, i. 176; uniformity of, in various parts of the world, i. 233; numerical proportion of male and female births among the, i. 291; ancient tattooing practised by, ii. 323.

Johnstone, Lieutenant, on the Indian elephant, i. 259.

Jollofs, fine appearance of the, ii. 341.

Jones, Albert, proportion of sexes of Lepidoptera reared by, i. 304.

Juan Fernandez, humming-birds of, ii. 212.

Junonia, sexual differences of coloring in species of, i. 377.

Jupiter, Greek statues of, ii. 333.

K.

Kaffre skull, occurrence of the diastema in a, i. 121.

Kaffres, their cruelty to animals, i. 90; lice of the, i. 213; color of the, ii. 330; engrossment of the handsomest women by the chiefs of the, ii. 352; marriage-customs of the, ii. 357.

Kalij-pheasant, drumming of the male, ii. 59; young of, ii. 182.

Kallima, resemblance of, to a withered leaf, i. 380.

Kangaroo, great red, sexual difference in the color of, ii. 273.

Kant, Immanuel, on duty, i. 67; on self-restraint, i. 83; on the number of species of man, i. 218.

Katy-did, stridulation of the, i. 342.

Keller, Dr., on the difficulty of fashioning stone implements, i. 133.

Kestrels, new mates found by, ii. 100.

Kidney, i. 112.

King, W. R., on the vocal organs of *Tetrao cupido*, ii. 55; on the drumming of grouse, ii. 60; on the reindeer, ii. 233; on the attraction of male deer by the voice of the female, ii. 263.

King and Fitzroy, on the marriage-customs of the Fuegians, ii. 357.

King-crows, nidification of, ii. 160.

Kingfisher, ii. 53; racket-shaped feathers in the tail of a, ii. 70.

Kingfishers, colors and nidification of the, ii. 163, 165, 168; immature plumage of the, ii. 180, 182; young of the, ii. 200.

King Lory, ii. 166; immature plumage of the, ii. 180.

Kingsley, C., on the sounds produced by *Umbrina*, ii. 22.

Kirby and Spence, on the courtship of insects, i. 263; on sexual differences in the length of the snout in curculionidæ, i. 247; on the elytra of *Dytiscus*, i. 333; on peculiarities in the legs of male insects, i. 334; on the relative size of the sexes in insects, i. 335; on the luminosity of insects, i. 335; on the Fulgoridæ, i. 340; on the habits of *Termites*, i. 353; on difference of color in the sexes of beetles, i. 356; on the horns of the male lamellicorn beetles, i. 359; on hornlike processes in male curculionidæ, i. 363; on the pugnacity of the male stag-beetle, i. 364.

Kite, killed by a game-cock, ii. 42.

Knot, retention of winter plumage by the, ii. 78.

Knox, R., on the semilunar fold, i. 23; on the occurrence of the supra-condyloid foramen in the humerus of man, i. 27; on the features of the young Memnon, i 209.

Koala, length of the cæcum in, i. 26.

Kölreuter, on the sterility of hybrid plants, i. 215.

Kobus ellipsiprymnus, proportion of the sexes in, i. 296.

Koodoo, development of the horns of the, i. 279; markings of the, ii. 287.

Köppen, F. T., on the migratory locust, i. 342.

Kordofan, protuberances artificially produced in, ii. 323.

Kowalevsky, A., on the affinity of the Ascidia to the Vertebrata, i. 197.

Kowalevsky, W., on the pugnacity of the male Capercailzie, ii. 42; on the pairing of the Capercailzie, ii. 47.

Krause, on a convoluted body at the extremity of the tail in a *Macacus* and a cat, i. 29.

Kupffer, Prof., on the affinity of the Ascidia to the Vertebrata, i. 197.

L.

Labidocera Darwinii, prehensile organs of the male, i. 320.

Labrus, splendid colors of the species of, ii. 15.

Labrus mixtus, sexual differences in, ii. 9.

Labrus pavo, ii. 15.

Lacertilia, sexual differences of, ii. 30.

Lafresnaye, M. de, on Birds of Paradise, ii. 73.

Lamarck, on the origin of man, i. 4.

Lamellibranchiata, i. 315.

Lamellicorn beetles, horn-like processes from the head and thorax of, i. 357, 362; analogy of, to Ruminants, i. 361; influence of sexual selection on, i. 365.

Lamellicornia, stridulation of, i. 368.

Lamont, Mr., on the tusks of the Walrus, ii. 231; on the use of its tusks by the Walrus, ii. 245.

Lampornis porphyrurus, colors of the female, ii. 160.

Lancelet, i. 196, 204.

Landois, H., on the production of sound by the Cicadæ, i. 340; on the stridulating organ of the Crickets, i. 344; on *Decticus*, i. 345; on the stridulating organs of

the Acridiidæ, i. 345; on the presence of rudimentary stridulating organs in some female Orthoptera, i. 348; on the stridulation of *Necrophorus*, i. 367; on the stridulant organ of *Cerambyx heros*, i. 368; on the stridulating organs in the Coleoptera, i. 370; on the ticking of *Anobium*, i. 373; on the stridulant organ of *Geotrupes*, i. 369.
Language an art, i. 53; articulate, origin of, i. 54; relation of the progress of, to the development of the brain, i. 55; effects of inheritance in production of, i. 56; complex structure of, among barbarous nations, i. 59; natural selection in, i. 59; gesture, i. 224; primeval, i. 226; of a lost tribe preserved by a parrot, i. 228.
Languages, presence of rudiments in, i. 58; classification of, i. 58; variability of, i. 58; crossing or blending of, i. 58; complexity of, no test of perfection or proof of special creation, i. 60; resemblance of, evidence of community of origin, i. 182.
Languages and species, identity of evidence of their gradual development, i. 57,
Lanius, ii. 172; characters of young, ii. 177.
Lanius rufus, anomalous young of, ii. 202.
Lankester, E. R., on comparative longevity, i. 161, 164; on the destructive effects of intemperance, i. 166.
Lanugo, of the human fœtus, i. 25; ii. 359.
Lapponian language, highly artificial, i. 59.
Lark, proportion of the sexes in the, i. 298; female, singing of the, ii. 51.
Larks, attracted by a mirror, ii. 107.
Lartet, E., on the size of the brain in mammals, i. 49; comparison of cranial capacities of skulls of recent and tertiary mammals, i. 140; on *Dryopithecus*, i. 191.
Larus, seasonal change of plumage in, ii. 218.
Larva, luminous, of a Brazilian beetle, i. 335.
Larynx, muscles of the, in song-birds, ii. 52.
Lasiocampa quercus, attraction of males by the female, i. 303; sexual difference of color in, i. 386
Latham, R. G., on the migrations of man, i. 131.
Latooka, perforation of the lower lip by the women of, ii. 325.
Laurillard, on the abnormal division of the malar bone in man, i. 119.
Lawrence, W., on the superiority of savages to Europeans in power of sight, i. 114; on the color of negro infants, ii. 303; on the fondness of savages for ornaments, ii. 322; on beardless races, ii. 332; on the beauty of the English aristocracy, ii. 341.
Layard, E. L., on an instance of rationality in a Cobra, ii. 29; on the pugnacity of *Gallus Stanleyi*, ii. 42.
Laycock, Dr., on vital periodicity, i. 12.
Leaves, decaying, tints of, i. 314.
Lecky, Mr., on the sense of duty, i. 68; on suicide, i. 90; on the practice of celibacy, i. 92; his view of the crimes of savages, i. 93; on the gradual rise of morality, i. 99.
Leconte, J. L., on the stridulant organ in the Coprini and Dynastini, i. 369.
Lee, H., on the numerical proportion of the sexes in the trout, i. 299.
Leg, calf of the, artificially modified, ii. 324.
Legitimate and illegitimate children, proportion of the sexes in, i. 292.
Legs, variation of the length of the, in man, i. 104; proportions of, in soldiers and sailors, i. 112; fore-, atrophied in some male butterflies, i. 334; peculiarities of, in male insects, i. 334.
"Lek" of the black-cock and capercailzie, ii. 96.
Lemoine, Albert, on the origin of language, i. 54.
Lemur macaco, sexual difference of color in, ii. 276.
Lemuridæ, i. 187; their origin, i. 204; position and derivation of the, i. 194; ears of the, i. 22; variability of the muscles in the, i. 123.
Lemurs, uterus in the, i. 118; tailless species of, i. 187.
Leopards, black, ii. 280.
Lepidoptera, i. 374; numerical proportions of the sexes in the, i. 301; coloring of, i. 375; ocellated spots of, ii. 127.
Lepidosiren, i. 196, 204.
Lenguas, disfigurement of the ears of the, ii. 325.
Leptorhynchus angustatus, pugnacity of male, i. 363.
Leptura testacea, difference of color in the sexes of, i. 356.
Lequay, on the occurrence of the supracondyloid foramen in the humerus of man, i. 28.
Leroy, on the wariness of young foxes in hunting-districts, i. 48; on the desertion of their young by swallows, i. 80.
Lesse, valley of the, i. 28.
Lesson, on the Birds of Paradise, i. 260, ii. 93; on the sea-elephant, ii. 265.
Lestis bombylans, difference of the sexes in, i. 354.
Lethrus cephalotes, pugnacity of the males of, i. 360, 364.
Leuckart, R., on the *vesicula prostatica*, i. 30; on the influence of the age of parents on the sex of offspring, i. 292.
Levator claviculæ muscle, i. 123.
Libellula depressa, color of the male, i. 352.
Libellulidæ, relative size of the sexes of, i. 337; difference in the sexes of, i. 351.
Lice of domestic animals and man, i. 211.
Licentiousness, prevalence of, among savages, i. 92; a check upon population, i. 129.
Lichtenstein, on *Chera progne*, ii. 115.

Life, inheritance at corresponding periods of, i. 271, 276.
Light, supposed effects of, i. 111; influence of, upon the colors of shells, i. 317.
Lilford, Lord. the ruff attracted by bright objects. ii. 107.
Limosa lapponica, ii. 195.
Linaria, ii. 172.
Linaria montana, i. 298.
Linnæus, views of, as to the position of man, i. 183.
Linnet, numerical proportion of the sexes in the, i. 298; crimson forehead and breast of the, ii. 82; courtship of the, ii. 90.
Linyphia, i. 328.
Lion, polygamous, i. 259; mane of the, defensive, ii. 254; roaring of the, ii. 262.
Lions, stripes of young, ii. 176.
Lips, piercing of the, by savages, ii. 325.
Lithobius, prehensile appendages of the female, i. 330.
Lithosia, coloration in, i. 383.
Littorina littorea, i. 315.
Livingstone, Dr., on the influence of dampness and dryness on the color of the skin, i. 233; on the liability of negroes to tropical fevers after residence in a cold climate, i. 234; on the spur-winged goose, ii. 44; on weaver-birds, ii. 60; on an African night-jar, ii. 69, 92; on the battle-scars of South African male mammals, ii. 228; on the removal of the upper incisors by the Batokas, ii. 324; on the perforation of the upper lip by the Makalolo, ii. 326; on the Banyai, ii. 327.
Livonia, numerical proportion of male and female births in, i. 292.
Lizards, relative size of the sexes of, ii. 30; gular pouches of, ii. 31.
Lloyd, L., on the polygamy of the capercailzie and bustard, i. 261; on the numerical proportion of the sexes in the capercailzie and black-cock, i. 297; on the salmon, ii. 5; on the colors of the sea-scorpion, ii. 9; on the pugnacity of male grouse, ii. 42; on the capercailzie and black-cock, ii. 47, 52; on the call of the capercailzie, ii. 58; on assemblages of grouse and snipes, ii. 97; on the pairing of a shield-drake with a common duck, ii. 109; on the battles of seals, ii. 229; on the elk, ii. 238.
Lobivanellus, wing-spurs in, ii. 46.
Local influences, effect of, upon stature, i. 110.
Lockwood, Mr., on the development of *Hippocampus*, i. 201.
Locust, bright-colored, rejected by lizards and birds, i. 350.
Locust, migratory, i. 342.
Locustidæ, stridulation of the, i. 341. 343; descent of the, i. 346.
Longicorn beetles, difference of the sexes of, in color, i. 356; stridulation of, i. 368.
Lonsdale, Mr., on an example of personal attachment in *Helix pomatia*, i. 316.
Lophobranchii, marsupial receptacles of the male, ii. 20.
Lophophorus, habits of, ii. 116.
Lophorina atra, sexual difference in coloration of, ii. 216.
Lophornis ornatus, ii. 73.
Lord, J. K., on *Salmo lycaodon*, ii. 5.
Lory, King, ii. 166; immature plumage of the, ii. 180.
Love-antics and dances of birds, ii. 65.
Lowne, B. T., on *Musca vomitoria*, i. 140, 339.
Loxia, characters of young of, ii. 176.
Lubbock, Sir J., on the antiquity of man, i, 3; on the origin of man, i. 4; on the mental capacity of savages, i. 33; on the origin of implements, i. 51; on the simplification of languages, i. 60; on the absence of the idea of God among certain races of men, i. 63; on the origin of the belief in spiritual agencies, i. 66; on superstitions, i. 66; on the sense of duty, i. 68; on the practice of burying the old and sick among the Fijians, i. 74; non-prevalence of suicide among the lowest barbarians, i. 90; on the immorality of savages, i. 93; on Mr. Wallace's claim to the origination of the idea of natural selection, i. 132; on the absence of remorse among savages, i. 158; on the former barbarism of civilized nations, i. 174; on improvements in the arts among savages, i. 175; on resemblances of the mental characters in different races of men, i. 224; on the power of counting in primeval man, i. 225; on the arts practised by savages, i. 225; on the prehensile organs of the male *Labidocera Darwinii*, i. 320; on *Chloëon*, i. 331; on *Smynthurus luteus*, i. 338; on strife for women among the North American Indians, ii. 308; on music, ii. 318; on the ornamental practices of savages, ii. 322; on the estimation of the beard among the Anglo-Saxons, ii. 333; on artificial deformation of the skull, ii. 335; on "communal marriages," ii. 342, 344; on exogamy, ii. 344, 348; on the Veddahs, ii. 347; on polyandry, ii. 349.
Lucanidæ, variability of the mandibles in the male, i. 364.
Lucanus, large size of males of, i. 336.
Lucanus cervus, numerical proportion of sexes of, i. 305; weapons of the male, i. 364.
Lucanus elaphus, use of mandibles of, i. 365; large jaws of male, i. 332.
Lucas, Prosper, on sexual preference in horses and bulls, ii. 260.
Lunar periods, i. 204.
Lund, Dr., on skulls found in Brazilian caves, i. 210.
Lungs, enlargement of, in the Quechua and Aymara Indians, i. 115; a modified swim-bladder, i. 198; different capacity of, in races of man, i. 208.
Luminosity in insects, i. 335.
Luschka, Prof., on the termination of the coccyx, i. 29.

Lust, instinct of, i. 35.

Luxury, comparatively innocuous, i. 164.

Lycæna, sexual differences of coloring in species of, i. 378.

Lyell, Sir C., on the antiquity of man, i. 3; on the origin of man, i. 4; on the parallelism of the development of species and languages, i. 57; on the extinction of languages, i. 58; on the Inquisition, i. 171; on the fossil remains of vertebrata, i. 193; on the fertility of mulattoes, i. 213.

Lynx, Canadian, throat-ruff of the, ii. 255.

Lyre-bird, assemblies of, ii. 97.

M.

Macacus, ears of, i. 22; convoluted body in the extremity of the tail of, i. 29; variability of the tail in species of, i. 144; whiskers of species of, ii. 269.

Macacus cynomolgus, superciliary ridge of, ii. 303; beard and whiskers of, becoming white with age, ii. 304.

Macacus inornatus, i. 145.

Macacus lasiotus, facial spots of, ii. 295.

Macacus radiatus, i. 184.

Macacus rhesus, sexual difference in the color of, ii. 279, 295.

Macalister, Prof., on variations of the *palmaris accessorius* muscle, i. 105; on muscular abnormalities in man, i. 123 124; on the greater variability of the muscles in men than in women, i. 266.

Macaws, Mr. Buxton's observations on, i. 76; screams of, ii. 58.

McCann, J., on mental individuality, i. 61.

McClelland, J., on the Indian cyprinidæ, ii. 17.

Macculloch, Colonel, on an Indian village without any female children, ii. 348.

Macculloch, Dr., on tertian ague in a dog, i. 13.

Maggillivray, W., on the vocal organs of birds, i. 57; on the Egyptian goose, ii. 44; on the habits of woodpeckers, ii. 60; on the habits of the snipe, ii. 61; on the whitethroat, ii. 66; on the moulting of the snipes, ii. 79; on the moulting of the anatidæ, ii. 81; on the finding of new mates by magpies, ii. 99; on the pairing of a blackbird and thrush, ii. 109; on pied ravens, ii. 121; on the guillemots, ii. 122; on the colors of the tits, ii. 166; on the immature plumage of birds, ii. 178; *et seqq.*

Machetes, sexes and young of, ii. 207.

Machetes pugnax, numerical proportion of the sexes in, i. 297; supposed to be polygamous, i. 261; pugnacity of the male, ii. 39; double moult in, ii. 78.

Mackintosh, on the moral sense, i. 67.

MacLachlan, R., on *Apatania muliebris* and *Boreus hyemalis*, i. 306; on the anal appendages of male insects, i. 332; on the pairing of dragon-flies, i. 337; on dragon-flies, i. 351, 352; on dimorphism in *Agrion*, i. 352; on the want of pugnacity in male dragon-flies, i. 353; on the ghost-moth in the Shetland Islands, i. 390.

McLennan, Mr., on the origin of the belief in spiritual agencies, i. 63; on the prevalence of licentiousness among savages, i. 92, ii. 342; on infanticide, i. 129, ii. 347; on the primitive barbarism of civilized nations, i. 174; on traces of the custom of the forcible capture of wives, i. 175, ii. 349; on polyandry, ii. 349,

McNeill, Mr., on the use of the antlers of deer, ii. 242; on the Scotch deerhound, ii. 249; on the long hairs of the throat of the stag, ii. 256; on the bellowing of stags, ii. 261.

Macrorhinus proboscideus, structure of the nose of, ii. 265.

Magpie, power of speech of, i. 57; stealing bright objects, ii. 107; nuptial assemblies of, ii. 98; new mates found by, ii. 99; young of the, ii. 200; coloration of the, ii. 220.

Magpies, vocal organs of the, ii. 52.

Maillard, M., on the proportion of the sexes in a species of *Papilio* from Bourbon, i. 301.

Maine, Mr., on the absorption of one tribe by another, i. 154; on the want of a desire for improvement, i. 160.

Makalolo, perforation of the upper lip by the, ii. 325.

Malar bone, abnormal division of, in man, i. 119.

Malay Archipelago, marriage-customs of the savages of the, ii. 357.

Malays, line of separation between the Papuans and the, i. 210; general beardlessness of the, ii. 306; staining of the teeth among, ii. 323; aversion of some, to hairs on the face, ii. 332.

Malays and Papuans, contrasted characters of, i. 208.

Male animals, struggles of, for the possession of the females, i. 251, 252; eagerness of, in courtship, i. 263, 264; generally more modified than female, i. 264, 266; differ in the same way from females and young, i. 276.

Male characters developed in females, i. 271; transfer of, to female birds, ii. 185.

Male, sedentary, of a hymenopterous parasite, i. 263.

Malefactors, i. 165.

Males, presence of rudimentary female organs in, i. 200.

Males and females, comparative mortality of, while young, i. 255, 267; comparative numbers of, i. 253, 255.

Malherbe, on the woodpeckers, ii. 166.

Malthus, T., on the rate of increase of population, i. 126, 127, 129.

Maluridæ, nidification of the, ii. 161.

Malurus, young of, ii. 207.

Mammæ, i. 246; rudimentary, in male mammals, i. 17, 30, 199-201; supernumerary, in women, i. 120; of male human subject, i. 125.

Mammalia, Prof. Owen's classification of, i. 180; genealogy of the, i. 195.

Mammals, secondary sexual characters of, ii. 228; weapons of, ii. 230; recent and tertiary, comparison of cranial capacity of, i. 140; relative size of the sexes of, ii. 248; pursuit of female, by the males, i. 263; parallelism of, with birds in secondary sexual characters, ii. 283; voices of, used especially during the breeding-season, ii. 316, 317.

Man, variability of, i. 104; erroneously regarded as more domesticated than other animals, i. 107; definitive origin of, i. 226; migrations of, i. 131; wide distribution of, i. 132; causes of the nakedness of, i. 143; supposed physical inferiority of, i. 150; numerical proportions of the sexes in, i. 255; a member of the Catarrhine group, i. 190; early progenitors of, i. 198; secondary sexual characters of, ii. 301; primeval condition of, ii. 351.

Mandans, correlation of color and texture of hair in the, i. 239.

Mandible, left, enlarged in the male of *Taphroderes distortus*, i. 334.

Mandibles, use of the, in *Ammophila*, i. 332; large, of *Corydalis cornutus*, i. 332; large, of male *Lucanus elaphus*, i. 332.

Mandrill, number of caudal vertebræ in the, i. 144; colors of the male, ii. 279, 282, 295.

Mantegazza, Prof., on the ornaments of savages, ii. 322, *et seqq.;* on the beardlessness of the New-Zealanders, ii. 332; on the exaggeration of natural characters by man, ii. 335.

Mantell, W., on the engrossment of pretty girls by the New-Zealand chiefs, ii. 352.

Mantis, pugnacity of species of, i. 349.

Marcus Aurelius, on the origin of the moral sense, i. 68; on the influence of habitual thoughts, i. 97.

Mareca Penelope, ii. 109.

Marks, retained throughout groups of birds, ii. 126.

Marriage, influence of, upon morals, i. 92; restraints upon, among savages, i. 128; influence of, on mortality, i. 169; development of, ii. 345.

Marriages, communal, ii. 342, 344; early, i. 168.

Marshall, Mr., on the brain of a Bushwoman, i. 208.

Marsupials, i. 194; possession of nipples by, i. 201; their origin from Monotremata, i. 204; uterus of, i. 118; development of the nictitating membrane in, i. 23; abdominal sacs of, i. 246; relative size of the sexes of, ii. 248; colors of, ii. 272.

Marsupium, rudimentary, in male marsupials, i. 199.

Martin, W. C. L., on alarm manifested by an orang at the sight of a turtle, i. 42; on the hair in *Hylobates*, i. 186; on a female American deer, ii. 246; on the voice of *Hylobates agilis*, ii. 264; on *Semnopithecus nemœus*, ii. 297.

Martin, on the beards of the inhabitants of St. Kilda, ii. 306.

Martins deserting their young, i. 80.

Martins, C., on death caused by inflammation of the vermiform appendage, 27.

Mastoid processes in man and apes, i. 138.

Maudsley, Dr., on the influence of the sense of smell in man, i. 23; on Laura Bridgman, i. 57; on the development of the vocal organs, i. 57.

Mayers, W. F., on the domestication of the goldfish in China, ii. 16.

Mayhew, E., on the affection between individuals of different sexes in the dog, ii. 258.

Maynard, C. J., on the sexes of *Chrysemys picta*, ii. 27.

Meckel, on correlated variation of the muscles of the arm and leg, i. 125.

Medicines, effect produced by, the same in man and in monkeys, i. 12.

Medusæ, bright colors of some, i. 313.

Megalithic structures, prevalence of, i. 224.

Megalophrys montana, sexual differences in, ii. 25, 26.

Megapicus validus, sexual difference of color in, ii. 166.

Megasoma, large size of males of, i. 337.

Meigs, Dr. A., on variation in the skulls of the natives of America, i. 104.

Meinecke, on the numerical proportion of the sexes in butterflies, i. 300.

Meliphagidæ, Australian, nidification of, ii. 161.

Melita, secondary sexual characters of, i. 322.

Meloë, difference of color in the sexes of a species of, i. 356.

Memory, manifestations of, in animals, i. 43.

Memnon, young, i. 209.

Mental characters, difference of, in different races of men, i. 208.

Mental faculties, variation of, in the same species, i. 35, 106; diversity of, in the same race of men, i. 105; inheritance of, i. 106; similarity of the, in different races of man, i. 223; of birds, ii. 103.

Mental powers, difference of, in the two sexes in man, ii. 310.

Menura Alberti, ii. 98; song of, ii. 53.

Menura superba, ii. 97, 98; long tails of both sexes of, ii. 157.

Merganser, trachea of the male, ii. 57.

Mergus cucullatus, speculum of, i. 281.

Mergus merganser, young of, ii. 181.

Merganser serrator, male plumage of, ii. 81.

Metallura, splendid tail-feathers of, ii. 146.

Methoca ichneumonides, large male of, i. 337.

Meves, M., on the drumming of the snipe ii. 61.

Mexicans, civilization of the, not foreign, i. 175.
Meyer, on a convoluted body at the extremity of the tail in a *Macacus* and a cat, i. 29.
Meyer, Dr. A., on the copulation of phryganidæ of distinct species, i. 332.
Migrations of man, effects of, i. 130.
Migratory instinct of birds, i. 76; vanquishing the maternal, i. 80, 87.
Mill, J. S., on the origin of the moral sense, i. 68; on the "greatest happiness principle," i. 93; on the difference of the mental powers in the sexes of man, ii. 312.
Millipedes, i. 330.
Milne-Edwards, H., on the use of the enlarged chela of the male *Gelasimus*, i. 322.
Milvago leucurus, sexes and young of, ii. 197.
Mimicry, i. 397.
Mimus polyglottus, ii. 105.
Mind, difference of, in man and the highest animals, i. 100; similarity of the, in different races, i. 223.
Minnow, proportion of the sexes in the, i. 299, 300.
Minnows, spawning habits of, ii. 15.
Mirror, larks attracted by, ii. 107.
Mivart, St. George, on the reduction of organs, i. 18; on the ears of the Lemuroidea, i. 23; on variability of the muscles in Lemuroidea, i. 123, 131; on the caudal vertebræ of monkeys, i. 144; on the classification of the primates, i. 150; on the orang and on man, i. 189; on differences in the lemuroidea, i. 190; on the crest of the male newt, ii. 23.
Mocking-thrush, partial migration of, ii. 105; young of the, ii. 209.
Modifications, unserviceable, i. 147.
Moles, numerical proportion of the sexes in, i. 296; battles of male, ii. 228.
Mollienesia petenensis, sexual difference in, ii. 9.
Mollusca, beautiful colors and shapes of, i. 316; absence of secondary sexual characters in the, i. 315.
Molluscoida, i. 197, 315.
Monacanthus scopas, and *M. Peronii*, sexual differences in, ii. 12.
Mongolians, perfection of the senses in, i. 114.
Monkey, protecting his keeper from a baboon, i. 75, 84; bonnet-, i. 184; rhesus, sexual difference in color of the, ii. 278, 296; mustache-, colors of the, ii. 277.
Monkeys, liability of, to the same diseases as man, i. 11; male, recognition of women by, i. 13; revenge taken by, i. 39, maternal affection in, i. 39; variability of the faculty of attention in, i. 43; using stones and sticks, i. 49; imitative faculties of, i. 54; signal-cries of, i. 56; sentinels posted by, i. 71; diversity of the mental faculties in, i. 106; mutual kindnesses of, i. 72; hands of the, i. 134; breaking hard fruits with stones, i. 134; basal caudal vertebræ of, embedded in the body, i. 145; human characters of, i. 184; gradation of species of, i. 218; beards of, ii. 269; ornamental characters of, ii. 291; analogy of sexual differences of, with those of man, ii. 303; different degrees of difference in the sexes of, ii. 307; expression of emotions by, ii. 320; generally monogamous habits of, ii. 345; polygamous habits of some, ii. 345; naked surfaces of, ii. 360; American, manifestation of reason in, i. 47; American, direction of the hair on the arms of some, i. 185.
Monogamy, not primitive, i. 175.
Monogenists, i. 220.
Mononychus pseudacori, stridulation of, i. 371.
Monotremata, i. 194; development of the nictitating membrane in, i. 23; lactiferous glands of, i. 200; connecting mammals with reptiles, i. 204.
Monstrosities, analogous, in man and lower animals, i. 109; caused by arrest of development, i. 116; correlation of, i. 125; transmission of, i. 216.
Montagu, G., on the habits of the black and red grouse, i. 260; on the pugnacity of the ruff, ii. 39; on the singing of birds, ii. 49; on the double moult of the male pintail, ii. 81.
Monteiro, Mr., on *Bucorax Abyssinicus*, ii. 69.
Montes de Oca, M., on the pugnacity of male Humming-birds, ii. 38.
Monticola cyanea, ii. 164.
Monuments, as traces of extinct tribes, i. 228.
Moose, battles of, ii. 229; horns of the, an incumbrance, ii. 248.
Moral and instinctive impulses, alliance of, i. 85.
Moral faculties, their influence on natural selection in man, i. 152.
Moral rules, distinction between the higher and lower, i. 96.
Moral sense, origin of the, i. 98; so called, derived from the social instincts, i. 93, 94.
Moral tendencies, inheritance of, i. 98.
Morality, supposed to be founded in selfishness, i. 93; test of, the general welfare of the community, i. 94; gradual rise of, i. 99; influence of a high standard of, i. 159.
Morgan, L. H., on the Beaver, i. 36; on the reasoning powers of the Beaver, i. 45; on the forcible capture of wives, i. 175; on the castoreum of the Beaver, ii. 266; marriage unknown in primeval times, ii. 343; on Polyandry, ii. 349.
Morris, F. O., on hawks feeding an orphan nestling, ii. 103.
Mortality, comparative, of females and males, i. 256, 267, 292.
Morton, on the number of species of man, i. 218.
Moschus moschiferus, odoriferous organs of, ii. 267.

Motacillæ, Indian, young of, ii. 182.
Moths, i. 382; absence of mouth in some male, i. 246; apterous female, i. 247; male, prehensile use of the tarsi by, i. 248; male, attracted by females, i. 302; coloration of, i. 385; sexual differences of color in, i. 385.
Motmot, racket-shaped feathers in the tail of a, ii. 70.
Moult, double, ii. 173; double annual, in birds, ii. 77.
Moulting of birds, ii. 204.
Moults, partial, ii. 79.
Mud-turtle, long claws of the male, ii. 26.
Mulattoes, persistent fertility of, i. 213; immunity of, from yellow fever, i. 234.
Mule, sterility and strong vitality of the, i. 213.
Mules, rational, i. 47.
Müller, Ferd., on the Mexicans and Peruvians, i. 176.
Müller, Fritz, on astomatous males of *Tanais*, i. 247; on the disappearance of spots and stripes in adult mammals, ii. 290; on the proportions of the sexes in some Crustacea, i. 307; on secondary sexual characters in various Crustaceans, i. 319, *et seqq.;* on the luminous larva of a beetle, i. 335; musical contest between male *Cicadæ*, i. 341; on the sexual maturity of young amphipod Crustacea, ii. 206.
Müller, J., on the nictitating membrane and semilunar fold, i. 23.
Müller, Max, on the origin of language, i. 55; struggle for life among the words, etc., of languages, i. 58.
Müller, S., on the Banteng, ii. 276; on the colors of *Semnopithecus chrysomelas*, ii. 277.
Muntjac-deer, weapons of the, ii. 245.
Murie, J., on the reduction of organs, i. 18; on the ears of the Lemuroidea, i. 23; on variability of the muscles of the Lemuroidea, i. 123, 131; basal caudal vertebræ of *Macacus inornatus* embedded in the body, i. 145; on differences in the Lemuroidea, i. 190; on the throat-pouch of the male Bustard, ii. 55; on the mane of *Otaria jubata*, ii. 255; on the sub-orbital pits of Ruminants, ii. 267; on the colors of the sexes in *Otaria nigrescens*, ii. 274.
Murray, A., on the *Pediculi* of different races of men, i. 211.
Murray, T. A., on the fertility of Australian women with white men, i. 212.
Mus coninga, i. 49.
Mus minutus, sexual difference in the color of, ii. 273.
Musca vomitoria, i. 139.
Muscicapa grisola, ii. 162.
Muscicapa luctuosa, ii. 162.
Muscicapa ruticilla, breeding in immature plumage, ii. 205.
Muscle, ischio-pubic, i. 123.
Muscles, rudimentary, occurrence of, in man, i. 19; variability of the, i. 105; effects of use and disuse upon, i. 112; animal-like abnormalities of, in man, i. 122; correlated variation of, in the arm and leg, i. 125; variability of, in the hands and feet, i. 131; of the jaws, influence of, on the physiognomy of the Apes, i. 139; habitual spasms of, causing modifications of the facial bones, i. 141; of the early progenitors of man, i. 198; greater variability of the, in men than in women, i. 266.
Musculus sternalis, Prof. Turner on the, i. 19.
Music, i. 224; of birds, ii. 48; discordant, love of savages for, ii. 64; different appreciation of, by different peoples, ii. 318; origin of, ii. 317, 321; effects of, ii. 320.
Musical cadences, perception of, by animals, ii. 317; powers of man, ii. 314, *et seqq.*
Musk-deer, canine teeth of male, ii. 231, 245, 246; male, odoriferous organs of the, ii. 267; winter change of the, ii. 285.
Musk-duck, Australian, ii. 36; large size of male, ii. 41; of Guiana, pugnacity of the male, ii. 41.
Musk-ox, horns of, ii. 236.
Musk-rat, protective resemblance of the, to a clod of earth, ii. 284.
Musophagæ, colors and nidification of the, ii. 163; both sexes of, equally brilliant, ii. 169.
Mussels opened by monkeys, i. 134.
Mustache-monkey, colors of the, ii. 277, 296.
Mustaches, in monkeys, i. 184.
Mustela, winter change of two species of, ii. 284.
Mutilations, healing of, i. 13.
Mutilla Europæa, stridulation of, i. 355.
Mutillidæ, absence of ocelli in female, i. 331.
Mycetes caraya, polygamous, i. 258; vocal organs of, ii. 264; beard of, ii. 269; sexual differences of color in, ii. 276; voice of, ii. 316.
Mycetes seniculus, sexual differences of color in, ii. 276.
Myriapoda, i. 330.

N.

Nägeli, on the influence of natural selection on plants, i. 146; on the gradation of species of plants, i. 219.
Nails, colored yellow or purple in part of Africa, ii. 322.
Naples, greater proportion of female illegitimate children in, i. 292.
Narwhal, tusks of the, ii. 231, 237.
Nasal cavities, large size of, in American aborigines, i. 114.
Nascent organs, i. 18.
Nathusius, H. von, on the improved breeds of pigs, i. 222; on the breeding of domestic animals, ii. 353.
Natural selection, its effects on the early

progenitors of man, i. 131; influence of, on man, i. 145, 148; limitation of the principle, i. 146; influence of, on social animals, i. 149; Mr. Wallace on the limitation of, by the influence of the mental faculties in man, i. 152; influence of, in the progress of the United States, i. 172.

Natural and sexual selection contrasted, i. 269.

Naulette, jaw from, large size of the canines in, i. 122.

Neanderthal skull, capacity of the, i. 140.

Neck, proportion of, in soldiers and sailors, i. 112.

Necrophorus, stridulation of, i. 367, 371.

Nectarinia, young of, ii. 182.

Nectariniæ, nidification of, ii. 161; moulting of the, ii. 79.

Negro, resemblance of a, to Europeans, in mental characters, i. 273.

Negro-women, their kindness to Mungo Park, i. 91.

Negroes, character of, i. 208; lice of, i. 212; blackness of, i. 216, ii. 365; variability of, i. 217, 218; immunity of, from yellow fever, i. 234; difference of, from Americans, i. 238; disfigurements of the, ii. 282; color of new-born children of, ii. 302; comparative beardlessness of, ii. 306; readily become musicians, ii. 318; appreciation of beauty of their women by, ii. 328, 330; idea of beauty among, ii. 334; compression of the nose by some, ii. 335.

Neolithic period, i. 176.

Neomorpha, sexual difference of the beak in, ii. 37.

Nephila, i. 328.

Nests, made by fishes, ii. 19; decoration of, by Humming-birds, ii. 107.

Neumeister, on a change of color in pigeons after several moultings, i. 284.

Neuration, difference of, in the two sexes of some butterflies and hymenoptera, i. 337.

Neuroptera, i. 306, 350.

Neurothemis, dimorphism in, i. 352.

New Zealand, expectation by the natives of, of their extinction, i. 232; practice of tattooing in, ii. 326; aversion of natives of, to hairs on the face, ii. 332; pretty girls engrossed by the chiefs in, ii. 352.

Newton, A., on the throat-pouch of the male bustard, ii. 55; on the difference between the females of two species of *Oxynotus*, ii. 184; on the habits of the phalarope, dotterel, and godwit, ii. 195.

Newts, ii. 23.

Nicholson, Dr., on the non-immunity of dark Europeans from yellow fever, i. 236.

Nictitating membrane, i. 23, 198.

Nidification, of fishes, ii. 18; relation of, to color, ii. 159, 165; of British birds, ii. 162.

Night-heron, cries of the, ii. 48.

Nightingale, arrival of the male before the female, i. 251; object of the song of the, ii. 49.

Nightingales, new mates found by, ii. 101.

Night-jar, selection of a mate by the female, ii. 111; Australian, sexes of, ii. 197; coloration of the, ii. 216.

Night-jars, noise made by some male, with their wings, ii. 59; elongated feathers in, ii. 69, 92.

Nilghau, sexual differences of color in the, ii. 273.

Nilsson, Prof., on the resemblance of stone arrow-heads from various places, i. 224; on the development of the horns in the reindeer, i. 279.

Nipples, absence of, in Monotremata, i. 200.

Nitzsch, C. L., on the down of birds, ii. 77.

Noctuæ, brightly colored beneath, i. 385.

Noctuidæ, coloration of, i. 382.

Nordmann, A., on *Tetrao urogalloides*, ii. 96.

Nomadic habits, unfavorable to human progress, i. 160.

Norway, numerical proportion of male and female births in, i. 291.

Nose, resemblance of, in man and the apes, i. 184; piercing and ornamentation of the, ii. 325; flattening of the, ii. 335; very flat, not admired in negroes, ii. 333.

Nott and Gliddon, on the features of Rameses II., i. 209; on the features of Amunoph III., i. 210; on skulls from Brazilian caves, i. 210; on the immunity of negroes and mulattoes from yellow fever, i. 234; on the deformation of the skull among American tribes, ii. 336.

Nudibranch mollusca, bright colors of, i. 317.

Numerals, Roman, i. 175.

Nunemaya, natives of, bearded, ii. 307, 332.

O.

Obedience, value of, i. 156.

Observation, powers of, possessed by birds, ii. 105.

Occupations, sometimes a cause of diminished stature, i. 111; effect of, upon the proportions of the body, i. 112.

Ocelli, absence of, in female Mutillidæ, i. 331.

Ocelli of birds, formation and variability of the, ii. 126.

Ocelot, sexual differences in the coloring of the, ii. 273.

Ocyphaps lophotes, ii. 92.

Odonata, i. 306.

Odonestis potatoria, sexual difference of color in, i. 386.

Odor, correlation of, with color of skin, i. 239; emitted by snakes in the breeding-season, ii. 28; of mammals, ii. 265.

Œcanthus nivalis, difference of color in the sexes of, i. 351.

Oidemia, ii. 216, 217.

Olivier, on sounds produced by *Pimelia striata*, i. 373.

Omaloplia brunnea, stridulation of, i. 369.

Onitis furcifer, processes of anterior femora of the male, and on the head and thorax of the female, i. 361.

Onthophagus, i. 360.

Onthophagus rangifer, sexual differences of, i. 358; variation in the horns of the male, i. 360.

Ophidia, sexual differences of, ii. 27.

Opossum, wide range of, in America, i. 211.

Optic nerve, atrophy of the, caused by destruction of the eye, i. 112.

Orang-Outan, ii. 308; Bischoff on the agreement of the brain of the, with that of man, i. 11; adult age of the, i. 13; ears of the, i. 21; vermiform appendage of, i. 26; platforms built by the, i. 35; alarmed at the sight of a turtle, i. 41; using a stick as a lever, i. 49; using missiles, i. 50; using the leaves of the *Pandanus* as a night covering, i. 51; hands of the, i. 134; absence of mastoid processes in the, i. 138; direction of the hair on the arms of the, i. 185; its aberrant characters, i. 188; supposed evolution of the, i. 222; voice of the, ii. 265; monogamous habits of the, ii. 345; male, beard of the, ii. 270.

Oranges, treatment of, by monkeys, i. 134.

Orange-tip butterfly, i. 376, 381.

Orchestia Darwinii, dimorphism of males of, i. 322.

Orchestia Tucuratinga, limbs of, i. 320, 327.

Ordeal, i. 66.

Oreas canna, colors of, ii. 274.

Oreas Derbianus, colors of, ii. 274, 286.

Organs, prehensile, i. 248; utilized for new purposes, ii. 319.

Organic scale, Von Baer's definition of progress in, i. 203.

Orioles, nidification of, ii. 160.

Oriolus, species of, breeding in immature plumage, ii. 205, 206.

Oriolus melanocephalus, coloration of the sexes in, ii. 170.

Ornaments, prevalence of similar, i. 224; fondness of savages for, ii. 324; of male birds, ii. 47.

Ornamental characters, equal transmission of, to both sexes, in mammals, ii. 283; of monkeys, ii. 291.

Ornithoptera Crœsus, i. 301.

Ornithorhynchus, i. 192; spur of the male, ii. 231; reptilian tendency of, i. 196.

Orocetes erythrogastra, young of, ii. 210.

Orrony, Grotto of, i. 28.

Orsodacna atra, difference of color in the sexes of, i. 357.

Orthoptera, i. 341; metamorphosis of, i. 282; stridulating, auditory apparatus of, i. 343; colors of, i. 349; rudimentary stridulating organs in female, i. 349; stridulation of the, and Homoptera, discussed, i. 349.

Ortygornis gularis, pugnacity of the male, ii. 42.

Oryctes, stridulation of, i. 369; sexual differences in the stridulant organs of, i 371.

Oryx leucoryx, use of the horns of, ii. 239 251.

Osphranter rufus, sexual difference in the color of, ii. 272.

Ostrich, African, sexes and incubation of the, ii. 196.

Ostriches, stripes of young, ii. 176.

Otaria jubata, mane of the male, ii. 255.

Otaria nigrescens, difference in the coloration of the sexes of, ii. 273.

Otis Bengalensis, love-antics of the male, ii. 65.

Otis tarda, polygamous, i. 261; throat-pouch of the male, ii. 55.

Ouzel, ring, colors and nidification of the, ii. 171.

Ouzel, water, colors and nidification of the, ii. 162.

Ovibos moschatus, horns of, ii. 236.

Ovipositor of insects, i. 246.

Ovis cycloceros, mode of fighting of, ii. 238.

Ovule of man, i. 14.

Owen, Prof., on the Corpora Wolffiana, i. 16; on the great-toe in man, i. 16; on the nictitating membrane and semilunar fold, i. 23; on the development of the posterior molars in different races of man, i. 26; on the length of the cæcum in the Koala, i. 26; on the coccygeal vertebræ, i. 29; on rudimentary structures belonging to the reproductive system, i. 30; on abnormal conditions of the human uterus, i. 119; on the number of digits in the Ichthyopterygia, i. 120; on the canine teeth in man, i. 121; on the walking of the chimpanzee and orang, i. 134; on the mastoid processes in the higher apes, i. 138; on the hairiness of elephants in elevated districts, i. 143; on the caudal vertebræ of monkeys, i. 144; classification of mammalia, i. 180; on the hair in monkeys, i. 186; on the piscine affinities of the Ichthyosaurians, i. 196; on polygamy and monogamy among the antelopes, i. 258; on the horns of *Antilocapra Americana*, i. 280; on the musky odor of crocodiles during the breeding-season, ii. 27; on the scent-glands of snakes, ii. 29; on the Dugong, Cachalot, and *Ornithorhynchus*, ii. 231; on the antlers of the red-deer, ii. 241; on the dentition of the Camelidæ, ii. 246; on the tusks of the Mammoth, ii. 247; on the horns of the Irish elk, ii. 247; on the voice in the giraffe, porcupine, and stag, ii. 261; on the laryngeal sac of the gorilla and orang, ii. 263; on the odoriferous glands of mammals, ii. 266, 267; on the effects of emasculation on the vocal organs of men, ii. 314; on the voice of *Hylobatis agilis*, ii. 316; on American monogamous monkeys, ii. 345.

Owls, white, new mates found by, ii. 100.

Oxynotus, difference of the females of two species of, ii. 184.

P.

Pachydermata, i. 259.

Paget, on the abnormal development of hairs in man, i. 24; on the thickness of the skin on the soles of the feet of infants, i. 113.

Painting, i. 224.

Palæmon, chelæ of a species of, i. 321.

Palæornis, sexual differences of color in, ii. 221.

Palæornis Javanicus, color of beak of, ii. 171.

Palæornis rosa, young of, ii. 180.

Palamedea cornuta, spurs on the wings of, ii. 44.

Paleolithic period, i. 176.

Palestine, habits of the chaffinch in, i. 298.

Pallas, on the perfection of the senses in the Mongolians, i. 114; on the want of connection between climate and the color of the skin, i. 232; on the polygamous habits of *Antilope saiga*, i. 258; on the lighter color of horses and cattle in winter in Siberia, i. 273; on the tusks of the musk-deer, ii. 245, 246; on the odoriferous glands of mammals, ii. 266; on the odoriferous glands of the musk-deer, ii. 267; on winter changes of color in mammals, ii. 284; on the ideal of female beauty in North China, ii. 328.

Palmaris accessorius muscle, variations of the, i. 105.

Pampas, horses of the, i. 227.

Pangenesis, hypothesis of, i. 271, 275.

Panniculus carnosus, i. 19.

Papilio, sexual differences of coloring in species of, i. 377; proportion of the sexes in North American species of, i. 301; coloration of the wings in species of, i. 383.

Papilio ascanius, i. 377.

Papilio Sesostris and *Childrenæ*, variability of, i. 389.

Papilio Turnus, i. 301.

Papilionidæ, variability in the, i. 389.

Papuans, line of separation between the, and the Malays, i. 210; beards of the, ii. 307; hair of, ii. 324.

Papuans and Malays, contrast in characters of, i. 208.

Paradise, Birds of, ii. 96, 173; supposed by Lesson to be polygamous, i. 260; rattling of their quills by, ii. 58; racket-shaped feathers in, ii. 70; sexual differences in color of, ii. 71; decomposed feathers in, ii. 70, 93; display of plumage by the male, ii. 85.

Paradisea apoda, barbless feathers in the tail of, ii. 70; plumage of, ii. 72; and *P. Papuana*, divergence of the females of, ii. 184.

Paradisea rubra, ii. 71, 72.

Paraguay, Indians of, eradication of eyebrows and eyelashes by, ii. 332.

Parakeet, Australian, variation in the color of the thighs of a male, ii. 121.

Parallelism of development of species and languages, i. 57.

Parasites on man and animals, i. 12; as evidence of specific identity or distinctness, i. 211; immunity from, correlated with color, i. 233.

Parental affection, partly a result of natural selection, i. 77.

Parents, age of, influence upon sex of offspring, i. 293.

Parinæ, sexual difference of color in, ii. 166.

Park, Mungo, negro women teaching their children to love the truth, i. 91; his treatment by the negro women, i. 91, ii. 311; on negro opinions of the appearance of white men, ii. 330.

Parrot, racket-shaped feathers in the tail of a, ii. 70; instance of benevolence in a, ii. 105.

Parrots, imitative faculties of, i. 43; change of color in, i. 146; living in triplets, ii. 102; affection of, ii. 104; colors of, ii. 213; sexual differences of color in, ii. 221; colors and nidification of the, ii. 163, 166, 168; immature plumage of the, ii. 180; musical powers of, ii. 319.

Parthenogenesis in the Tenthredinæ, i. 305; in Cynipidæ, i. 305; in Crustacea, i. 306.

Partridge, monogamous, i. 261; proportion of the sexes in the, i. 297; female, ii. 186.

"Partridge-dances," ii. 65.

Partridges, living in triplets, ii. 102; spring coveys of male, ii. 103; distinguishing persons, ii. 106.

Parus cæruleus, ii. 166.

Passer, sexes and young of, ii. 203.

Passer brachydactylus, ii. 203.

Passer domesticus, ii. 162, 203.

Passer montanus, ii. 162, 203.

Patagonians, self-sacrifice by, i. 84.

Patterson, Mr., on the *Agrionidæ*, i. 351.

Paulistas of Brazil, i. 216.

Pavo cristatus, i. 281, ii. 130.

Pavo muticus, i. 290, ii. 130; possession of spurs by the female, ii. 44, 155.

Pavo nigripennis, ii. 115.

Payaguas Indians, thin legs and thick arms of the, i. 112.

Payan, Mr., on the proportion of the sexes in sheep, i. 295.

Peacock, polygamous, i. 261; sexual characters of, i. 281; pugnacity of the, ii. 44; rattling of the quills by, ii. 58; elongated tail-coverts of the, ii. 69, 93; love of display of the, ii. 130, 65, 83; ocellated spots of the, ii. 130; inconvenience of long tail of the, to the female, ii. 147, 157, 158; continued increase of beauty of the, ii. 206.

Peacock-butterfly, i. 380.

Peafowl, preference of females for a particular male, ii. 116; first advances made by the female, ii. 116.

Pediculi of domestic animals and man, i. 211.

Pedigree of man, i. 205.

Pedionomus torquatas, sexes of, ii. 192.
Peewit, wing-tubercles of the male, ii. 44.
Pelagic animals, transparency of, i. 314.
Pelecanus erythrorhynchus, horny crest on the beak of the male, during the breeding-season, ii. 76.
Pelecanus onocrotalus, spring plumage of, ii. 81.
Pelelé, ii. 325.
Pelican, blind, fed by his companions, i. 74; young, guided by old birds, i. 74; pugnacity of the male, ii. 41.
Pelicans, fishing in concert, i. 72.
Pelobius Hermanni, stridulation, of, i. 368, 370.
Pelvis, alteration of, to suit the erect attitude of man, i. 137; differences of the, in the sexes in man, ii. 302.
Penelope nigra, sound produced by the male, ii. 61.
Pennant, on the battles of seals, ii. 229; on the bladder-nose seal, ii. 265.
Penthe, antennal cushions of the male, i. 333.
Perch, brightness of male, during breeding-season, ii. 13.
Peregrine Falcon, new mate found by, ii. 100.
Period of variability, relation of, to sexual selection, i. 287.
Periodicity, vital, Dr. Laycock on, i. 12.
Periods, lunar, followed by functions in man and animals, i. 12, 204.
Periods of life, inheritance at corresponding, i. 271, 276.
Perisoreus Canadensis, young of, ii. 200.
Peritrichia, difference of color in the sexes of a species of, i. 356.
Periwinkle, i. 315.
Pernis cristata, ii. 121.
Perseverance, a characteristic of man, ii. 312.
Persians, said to be improved by intermixture with Georgians and Circassians, ii. 341.
Personnat, M., on *Bombyx Yamamai*, i. 301.
Peruvians, civilization of the, not foreign, i. 176.
Petrels, colors of, ii. 220.
Petrocincla cyanea, young of, ii. 210.
Petronia, ii. 203.
Pfeiffer, Ida, on Javanese ideas of beauty, ii. 331.
Phacochœrus Æthiopicus, tusks and pads of, ii. 253.
Phalanger, Vulpine, black varieties of the, ii. 280.
Phalaropus fulicarius, ii. 194.
Phalaropus hyperboreus, ii. 194.
Phanæus, i. 361.
Phanæus carnifex, variation of the horns of the male, i. 369.
Phanæus faunus, sexual differences of, i. 358.
Phanæus lancifer, i. 359.
Phasgonura viridissima, stridulation of, i. 344, 345.
Phasianus Sœmmerringii, ii. 150.
Phasianus versicolor, ii. 85.
Phasianus Wallichii, ii. 89, 187.
Phasmidæ, mimicry of leaves by the, i. 401.
Pheasant, polygamous, i. 261; production of hybrids with the common fowl, ii. 117; and black grouse, hybrids of, ii. 109; immature plumage of the, ii. 180.
Pheasant, Argus, ii. 69, 173; display of plumage by the male, ii. 88; ocellated spots of the, ii. 128, 135; gradation of characters in the, ii. 135.
Pheasant, Blood-, ii. 42.
Pheasant, Cheer, ii. 89, 187.
Pheasant, Eared, i. 290; ii. 89, 187; sexes alike in the, ii. 170; length of the tail in the, ii. 158.
Pheasant, Golden, display of plumage by the male, ii. 85; sex of young, ascertained by pulling out head-feathers, ii, 205; age of mature plumage in the, ii. 204.
Pheasant, Kalij, drumming of the male, ii. 59.
Pheasant, Reeves, length of the tail in, ii. 158.
Pheasant, Silver, sexual coloration of the, ii. 218; triumphant male, deposed on account of spoiled plumage, ii. 115.
Pheasant, Sœmmerring's, ii. 149, 158.
Pheasant, Tragopan, ii. 68; display of plumage by the male, ii. 87; markings of the sexes of the, ii. 128.
Pheasants, period of acquisition of male characters in the family of the, i. 280; proportion of sexes in chicks of, i. 297; length of the tail in, ii. 149, 157, 158.
Philodromus, i. 328.
Philters, worn by women, ii. 328.
Phoca Grœnlandica, sexual difference in the coloration of, ii. 273.
Phœnicura ruticilla, ii. 101.
Phosphorescence of insects, i. 345.
Phryganidæ, copulation of distinct species of, i. 332.
Phryniscus nigricans, ii. 24.
Physical inferiority, supposed, of man, i. 149.
Pickering, on the number of species of man, i. 218.
Picton, J. A., on the soul of man, ii. 378.
Picus auratus, ii. 41.
Pieridæ, mimicry by female, i. 399.
Pieris, i. 380.
Pigeon, carrier, late development of the wattle in, i. 284; domestic, breeds and subbreeds of, ii. 170; pouter, late development of the crop in, i. 284; female, deserting a weakened mate, i. 254.
Pigeons, nestling, fed by the secretion of the crop of both parents, i. 202; changes of plumage in, i. 272; transmission of sexual peculiarities in, i. 274; changing color after several moultings, i. 284; numerical proportion of the sexes in, i. 296; cooing of, ii. 58; variations in plumage

of, ii. 71; display of plumage by male, ii. 92; local memory of, ii. 105; antipathy of female, to certain males, ii. 114; pairing of, ii. 115; profligate male and female, ii. 114; wing-bars and tail-feathers of, ii. 125; supposititious breed of, ii. 148; pouter and carrier, peculiarities of predominant in males, ii. 150; nidification of, ii. 160; immature plumage of the, ii. 180; Australian, ii. 167; Belgian, with black-streaked males, i. 285, 293; ii. 150.

PIGS, origin of the improved breeds of, i. 222; numerical proportion of the sexes in, i. 295; stripes of young, ii. 176, 288; sexual preference shown by, ii. 260.

PIKE, American, brilliant colors of the male, during the breeding-season, ii. 14.

PIKE, male, devoured by females, i. 299.

PIKE, L. O., on the psychical elements of religion, i. 66.

Pimelia striata, sounds produced by the female, i. 373.

PINTAIL Drake, plumage of, ii. 81; pairing with a wild-duck, ii. 110.

PINTAIL Duck, pairing with a Widgeon, ii. 109.

PIPE-FISH, filamentous, ii. 18; marsupial receptacles of the male, ii. 20.

PIPITS, moulting of the, ii. 79.

Pipra, modified secondary wing-feathers of male, ii. 62.

Pipra deliciosa, ii. 62, 63.

Pirates stridulus, stridulation of, i. 340.

Pithecia leucocephala, sexual differences of color in, ii. 277.

Pithecia Satanas, beard of, ii. 269, 272; resemblance of, to a negro, ii. 365.

PITS, suborbital, of Ruminants, ii. 267.

PITTIDÆ, nidification of, ii. 160.

PLACENTATA, i. 194.

PLAGIOSTOMOUS fishes, ii. 1.

PLAIN-WANDERER, Australian, ii. 192.

Planariæ, bright colors of some, i. 313.

PLANTAIN-EATERS, colors and nidification of the, ii. 163; both sexes of, equally brilliant, ii. 169.

PLANTS, cultivated, more fertile than wild, i. 127; Nägeli, on natural selection in, i. 146; male flowers of, mature before the female, i. 252; phenomena of fertilization in, i. 265; relation between number and size of seeds in, i. 309.

Platalea, ii. 57; change of plumage in, ii. 171.

Platyblemnus, i. 350.

Platycercus, young of, ii. 200.

Platyphyllum concavum, i. 342, 345.

PLATYRRHINE monkeys, i. 188.

PLATYSMA *myoides*, i. 19.

Plecostomus, head-tentacles of the male of a species of, ii. 10.

Plecostomus barbatus, peculiar beard of the male, ii. 10.

Plectropterus gambensis, spurred wings of, ii. 44.

Ploceus, ii. 52.

PLOVERS, wing-spurs of, ii. 44; double moult in, ii. 79.

PLUMAGE, changes of, inheritance of, by fowls, i. 272; tendency to analogous variation in, ii. 70; display of, by male birds, ii. 82, 92; changes of, in relation to season, ii. 172; immature, of birds, ii. 175, 179; color of, in relation to protection, ii. 213.

PLUMES on the head in birds, difference of, in the sexes, ii. 156.

Pneumora, structure of, i. 346.

Podica, sexual difference in the color of the irides of, ii. 123.

POEPPIG, on the contact of civilized and savage races, i. 230.

POISON, avoidance of, by animals, i. 48.

POISONOUS fruits and herbs avoided by animals, i. 35.

POISONS, immunity from, correlated with color, i. 233.

POLISH fowls, origin of the crest in, i. 275.

POLLEN and Van Dam, on the colors of *Lemur macaco*, ii. 276.

POLYANDRY, ii. 349; in certain cyprinidæ, i. 306; among the elateridæ, i. 305.

POLYDACTYLISM in man, i. 120.

POLYGAMY, influence of, upon sexual selection, i. 257; superinduced by domestication, i. 262; supposed increase of female births by, i. 293; in the stickleback, ii. 2.

POLYGENISTS, i. 220.

POLYNESIA, prevalence of infanticide in, ii. 347.

POLYNESIANS, aversion of, to hairs on the face, ii, 332; wide geographical range of, i. 108; difference of stature among the, i. 110; crosses of, i. 217; variability of, i. 217; heterogeneity of the, i. 232.

Polyplectron, display of plumage by the male, ii. 86; number of spurs in, ii. 43; gradation of characters in, ii. 131; female of, ii. 185.

Polyplectron chinquis, ii. 86, 132, 133.

Polyplectron Hardwickii, ii. 132, 133.

Polyplectron Malaccense, ii. 133, 134.

Polyplectron Napoleonis, ii. 132, 134.

POLYZOA, i. 315.

Pontoporeia affinis, i. 319.

PORCUPINE, mute, except in the rutting-season, ii. 261.

PORES, excretory, numerical relation of, to the hairs in sheep, i. 239.

Porpitæ, bright colors of some, i. 313.

Portax picta, dorsal crest and throat-tuft of, ii. 268; sexual differences of color in, ii. 274, 286.

Portunus puber, pugnacity of, i. 323.

Potamochoerus penicillatus, tusks and facial knobs of the, ii. 254.

POUCHET, G., on the ratio of instinct and intelligence, i. 36; on the instincts of ants, i. 180; on the caves of Abou-Simbel, i. 209; on the immunity of negroes from yellow fever, i 234.

POUTER pigeon, late development of the large crop in, i. 284.

POWER, Dr., on the different colors of the sexes in a species of *Squilla*, i. 326.

Powys, Mr., on the habits of the chaffinch in Corfu, i. 298.

Preëminence of man, i. 131.

Preference for males by female birds, ii. 108, 117; shown by mammals, in pairing, ii. 256.

Prehensile organs, i. 248.

Presbytis entellus, fighting of the male, ii. 309.

Preyer, Dr., on supernumerary mammæ in women, i. 120.

Prichard, on the difference of stature among the Polynesians, i. 110; on the connection between the breadth of the skull in the Mongolians and the perfection of their senses, i. 114; on the capacity of British skulls of different ages, i. 140; on the flattened heads of the Colombian savages, ii. 324; on Siamese notions of beauty, ii. 329; on the beardlessness of the Siamese, ii. 332; on the deformation of the head among American tribes and the natives of Arakhan, ii. 335.

Primary sexual organs, i. 246.

Primates, i. 183; sexual differences of color in, ii. 277.

Primogeniture, evils of, i. 163.

Primula, relation between number and size of seeds in, i. 309.

Prionidæ, difference of the sexes in color, i. 356.

Proctotretus multimaculatus, ii, 24, 35.

Proctotretus tenuis, sexual difference in the color of, ii. 35.

Profligacy, i. 166.

Progenitors, early, of man, i. 198.

Progress, not the normal rule in human society, i. 160; elements of, i. 170.

Prong-horn, horns of, i. 280.

Proportions, difference of, in distinct races, i. 208.

Protective coloring in butterflies, i. 392; in lizards, ii. 35; in birds, ii. 188, 214; in mammals, ii. 283, 284.

Protective nature of the dull coloring of female Lepidoptera, i. 390, 392, 401.

Protective resemblances in fishes, ii. 18.

Protozoa, absence of secondary sexual characters in, i. 312.

Pruner-Bey, on the occurrence of the supra-condyloid foramen in the humerus of man, i. 28; on the color of negro infants, ii. 303.

Prussia, numerical proportion of male and female births in, i. 292.

Psocus, proportions of the sexes in, i. 306.

Ptarmigan, monogamous, i. 261; summer and winter plumage of the, ii. 78, 79; nuptial assemblages of, ii. 97; triple moult of the, ii. 173; protective coloration of, ii. 189.

Puff-birds, colors and nidification of the, ii. 163.

Pugnacity of fine-plumaged male birds, ii. 89.

Pumas, stripes of young, ii. 175.

Puppies learning from cats to clean their faces, i. 43.

Pycnonotus hæmorrhous, pugnacity of the male, ii. 89; display of under-tail coverts by the male, ii. 91.

Pyranga æstiva, male aiding in incubation. ii. 159.

Pyrodes, difference of the sexes in color, i. 356.

Q.

Quadrumana, hands of, i. 134; differences between man and the, i. 183; dependence of, on climate, i. 210; sexual differences of color in, ii. 276; ornamental characters of, ii, 291; analogy of sexual differences of, with those of man, ii. 303; fighting of males for the females, ii. 309; monogamous habits of, ii. 345; beards of the, ii. 361.

Quain, R., on the variation of the muscles in man, i. 105.

Quatrefages, A. de, on the occurrence of a rudimentary tail in man, i. 28; on the moral sense as a distinction between man and animals, i. 67; on variability, i. 108; on the fertility of Australian women with white men, i. 213; on the Paulistas of Brazil, i. 216; on the evolution of the breeds of cattle, i. 222; on the Jews, i. 233; on the liability of negroes to tropical fevers after residence in a cold climate, i. 234; on the difference between field- and house-slaves, i. 237; on the influence of climate on color, i. 237; on the Ainos, ii. 306; on the women of San Giuliano, ii. 341.

Quechua Indians, i. 114; local variation of color in the, i. 237; no gray hair among the, ii. 320; hairlessness of the, ii. 307; long hair of the, ii. 331.

Querquedula acuta, ii. 109.

Quiscalus major, proportions of the sexes of, in Florida and Honduras, i. 298.

R.

Rabbit, white tail of the, ii. 284.

Rabbits, danger-signals of, i. 71; domestic elongation of the skull in, i. 142; modification of the skull in, by the lopping of the ear, i. 142; numerical proportion of the sexes in, i. 295.

Races, distinctive characters of, i. 208; or species of man, i. 210; crossed, fertility or sterility of, i. 212; of man, variability of the, i. 217; of man, resemblance of, in mental characters. i. 223; formation of, i. 225; of man, extinction of, i. 226; effects of the crossing of, i. 231; of man, formation of the, i. 231; of man, children of the, ii. 303; beardless, aversion of, to hairs on the face, ii. 333.

Raffles, Sir S., on the Banteng, ii. 276.

Rafts, use of, i. 132, 225.

Rage, manifested by animals, i. 39.

Raia batis, teeth of, ii. 6

Raia clavata, female spines on the back, ii. 2; sexual difference in the teeth of, ii. 6.

Raia maculata, teeth of, ii. 6.

Rails, spur-winged, ii. 44.

Ram, mode of fighting of the, ii. 238; African, mane of an, ii. 271; fat-tailed, ii. 271.

Rameses II., i. 209.

Ramsay, Mr., on the Australian Musk-duck, ii. 36; on the Regent-bird, ii. 108; on the incubation of *Menura superba*, ii. 157.

Rana esculenta, vocal sacs of, ii. 26.

Rat, common, general dispersion of, a consequence of superior cunning, i. 49; supplantation of the native, in New Zealand, by the European rat, i. 231; common, said to be polygamous, i. 259; numerical proportion of the sexes in, i. 296.

Rats, enticed by essential oils, ii. 267.

Rationality of birds, ii. 104.

Rattlesnakes, difference of the sexes in the, ii. 28; said to use their rattles as a sexual call, ii. 28.

Raven, vocal organs of the, ii. 52; stealing bright objects, ii. 107; pied, of the Feroe Islands, ii. 121.

Rays, prehensile organs of male, ii. 1.

Razor-bill, young of the, ii. 208.

Reade, Winwood, on the Guinea sheep, i. 280; non-development of horns in castrated male Guinea-sheep, ii. 236; on the occurrence of a mane in an African ram, ii. 271; on the negroes' appreciation of the beauty of their women, ii. 328; on the admiration of negroes for a black skin, ii. 330; on the idea of beauty among negroes, ii. 334; on the Jollofs, ii. 341; on the marriage-customs of the negroes, ii. 357.

Reason, in animals, i. 45.

Redstart, American, breeding in immature plumage, ii. 205.

Redstarts, new mates found by, ii. 101.

Reduviidæ, stridulation of, i. 340.

Reed-bunting, head-feathers of the male, ii. 91; attacked by a bullfinch, ii. 106.

Reefs, fishes frequenting, ii. 17.

Regeneration, partial, of lost parts in man, i. 13.

Regent-bird, ii. 108.

Reindeer, antlers of, with numerous points, ii. 241; sexual preferences shown by, ii. 260; horns of the, i. 279; winter change of the, ii. 284; battles of, ii. 229; horns of the female, ii. 232.

Relationship, terms of, ii. 344.

Religion, deficiency of, among certain races, i. 62; psychical elements of, i. 65.

Remorse, i. 87; deficiency of, among savages, i. 158.

Rengger, on the diseases of *Cebus Azaræ*, i. 11; on maternal affection in a *Cebus*, i. 39; revenge taken by monkeys, i. 39; on the reasoning powers of American monkeys, i. 45; on the use of stones by monkeys for cracking hard nuts, i. 49; on the sounds uttered by *Cebus Azaræ*, i. 52; on the signal-cries of monkeys, i. 55; on the diversity of the mental faculties of monkeys, i. 106; on the Payaguas Indians, i. 112; on the inferiority of Europeans to savages in their senses, i. 114; on the polygamous habits of *Mycetes caraya*, i. 258; on the voice of the howling monkeys, ii. 264; on the odor of *Cervus campestris*, ii. 266; on the beards of *Mycetes caraya* and *Pithecia Satanas*, ii. 269; on the colors of *Felis mitis*, ii. 274; on the colors of *Cervus paludosus*, ii. 276; on sexual differences of color in *Mycetes*, ii. 277; on the color of the infant Guaranys, ii. 303; on the early maturity of the female of *Cebus Azaræ*, ii. 303; on the beards of the Guaranys, ii. 307; on the emotional notes employed by monkeys, ii. 320; on American polygamous monkeys, ii. 346.

Representative species, of birds, ii. 182, 183.

Reproduction, unity of phenomena of, throughout the mammalia, i. 13; period of, in birds, ii. 205.

Reproductive system, rudimentary structures in the, i. 29; accessory parts of, i. 199.

Reptiles, ii. 26.

Reptiles and birds, alliance of, i. 204.

Resemblances, small, between man and the apes, i. 184.

Retrievers, exercise of reasoning faculties by, i. 46.

Revenge, manifested by animals, i. 39.

Reversion, i. 117; perhaps the cause of some bad dispositions, i. 166.

Rhagium, difference of color in the sexes of a species of, i. 356.

Ramphastos carinatus, ii. 217.

Rhinoceros, nakedness of, i. 143; horns of, ii. 236; horns of, used defensively, ii. 251; attacking white or gray horses, ii. 281.

Rhynchaæ, sexes and young of, ii. 193.

Rhynchaæ Australis, ii. 193.

Rhynchæa Bengalensis, ii. 193.

Rhynchæa capensis, ii. 193.

Rhythm, perception of, by animals, ii. 317.

Richard, M., on rudimentary muscles in man, i. 19.

Richardson, Sir J., on the pairing of *Tetrao umbellus*, ii. 46; on *Tetrao urophasianus*, ii. 56; on the drumming of grouse, ii. 60; on the dances of *Tetrao phasianellus*, ii. 66; on assemblages of grouse, ii. 97; on the battles of male deer, ii. 229; on the reindeer, ii. 233; on the horns of the musk-ox, ii. 236; on antlers of the reindeer, with numerous points, ii. 241; on the moose, ii. 247.

Richardson, on the Scotch deer-hound, ii. 250.

Richter, Jean Paul, on imagination, i. 44.

Riedel, on profligate female pigeons, ii. 114.

Ring-ouzel, colors and nidification of the, ii. 162.

Ripa, Father, on the difficulty of distinguishing the races of the Chinese, i. 207.

Rivalry, in singing, between male birds, ii. 50.

River-hog, African, tusks and knobs of the, ii. 254.

Rivers, analogy of, to islands, i. 196.

Roach, brightness of male during breeding-season, ii. 13.

Robbery, of strangers, considered honorable, i. 90.

Robertson, Mr., remarks on the development of the horns in the roebuck and red-deer, i. 279.

Robin, pugnacity of the male, ii. 38; autumn song of the, ii. 51; female, singing of the, ii. 51; attacking other birds with red in their plumage, ii. 106; young of the, ii. 199.

Robinet, on the difference of size of the male and female cocoons of the silk-moth, i. 335.

Rodents, uterus in the, i. 118; absence of secondary sexual characters in, i. 259; sexual differences in the colors of, ii. 272.

Roe, winter change of the, ii. 284.

Rolle, F., on the origin of man, i. 4; on a change in German families settled in Georgia, i. 237.

Roller, ii. 53.

Romans, ancient, gladiatorial exhibitions of the, i. 97.

Rook, voice of the, ii. 58.

Rössler, Dr., on the resemblance of the lower surface of butterflies to the bark of trees, i. 380.

Rostrum, sexual difference in the length of, in some weevils, i. 247.

Rudimentary organs, i. 17; origin of, i. 31.

Rudiments, presence of, in languages, i. 58.

Rudolphi, on the want of connection between climate and the color of the skin, i. 232.

Ruff, supposed to be polygamous, i. 261; proportion of the sexes in the, i. 297; pugnacity of the, ii. 39, 44; double moult in, ii. 78, 80; duration of dances of, ii. 96; attraction of the, to bright objects, ii. 107.

Ruminants, male, disappearance of canine teeth in, i. 139; ii. 311; generally polygamous, i. 258; analogy of Lamellicorn beetles to, i. 362; suborbital pits of, ii. 267; sexual differences of color in, ii. 274.

Rupicola crocea, display of plumage by the male, ii. 88.

Rüppell, on canine teeth in deer and antelopes, ii. 246.

Russia, numerical proportion of male and female births in, i. 291.

Ruticilla, ii. 172.

Rütimeyer, Prof., on the sexual differences of monkeys, ii. 308.

Rutlandshire, numerical proportion of male and female births in, i. 291.

S.

Sachs, Prof., on the behavior of the male and female elements in fertilization, i. 265.

Sacrifices, Human, i. 175.

Sagittal crest in male apes and Australians, ii. 304.

Sahara, birds of the, ii. 164; animal inhabitants of the, ii. 214.

Sailors, growth of, delayed by conditions of life, i. 110; long-sighted, i. 113.

Sailors and soldiers, difference in the proportions of, i. 112.

St. John, Mr., on the attachment of mated birds, ii. 104.

St. Kilda, beards of the inhabitants of, ii. 306.

Salmo eriox, and *S. umbla*, coloring of the male, during the breeding-season, ii. 14.

Salmo lycaodon, ii. 4.

Salmo salar, ii. 4.

Salmon, leaping out of fresh water, i. 80; male, ready to breed before the female, i. 252; proportion of the sexes in, i. 299; male, pugnacity of the, ii. 3; male, characters of, during the breeding-season, ii. 3, 14; spawning of the, ii. 18; breeding of immature male, ii. 206.

Salvin, O., on the Humming-birds, i. 260; ii. 161; on the numerical proportion of the sexes in Humming-birds, i. 298, ii. 212; on *Chamæpetes* and *Penelope*, ii. 61; on *Selasphorus platycercus*, ii. 62; on *Pipra deliciosa*, ii. 63; on *Chasmorhynchus*, ii. 76.

Samoa Islands, beardlessness of the natives of, ii. 307, 333.

Sand-skipper, i. 323.

Sandwich Islands, variation in the skulls of the natives of the, i. 105; superiority of the nobles in the, ii. 340.

Sandwich Islanders, lice of, i. 211.

San Giuliano, women of, ii. 341.

Santali, recent rapid increase of the, i. 128; Mr. Hunter on the, i. 232.

Saphirina, characters of the males of, i. 326.

Sarkidiornis melanonotus, characters of the young, ii. 177.

Sars, O., on *Pontoporeia affinis*, i. 319.

Saturnia carpini, attraction of males by the female, i. 303.

Saturnia Io, difference of coloration in the sexes of, i. 385.

Saturniidæ, coloration of the, i. 383, 385.

Savage, Dr., on the fighting of the male gorillas, ii. 309; on the habits of the gorilla, ii. 346.

Savage and Wyman, on the polygamous habits of the gorilla, i. 258.

Savages, imitative faculties of, i. 55, 155; causes of low morality of, i. 93; uniformity of, exaggerated, i. 107; long-sighted

118; rate of increase among, usually small, i. 117; retention of the prehensile power of the feet by, i. 136; tribes of, supplanting one another, i. 154; improvements in the arts among, i. 175; arts of, i. 225; fondness of, for rough music, ii. 64; attention paid by, to personal appearance, ii. 322; relation of the sexes among, ii. 347.

Saw-fly, pugnacity of a male, i. 353.

Saw-flies, proportions of the sexes in, i. 305.

Saxicola rubicola, young of, ii. 210.

Scalp, motion of the, i. 20.

Scent-glands in snakes, ii. 28.

Schaaffhausen, Prof., on the development of the posterior molars in different races of man, i. 26; on the jaw from La Naulette, i. 122; on the correlation between muscularity and prominent supra-orbital ridges, i. 126; on the mastoid processes of man, i. 138; on modifications of the cranial bones, i. 141; on human sacrifices, i. 175; on the probable speedy extermination of the anthropomorphous apes, i. 193; on the ancient inhabitants of Europe, i. 228; on the effects of use and disuse of parts, i. 238; on the superciliary ridge in man, ii. 301; on the absence of race-differences in the infant skull in man, ii. 303; on ugliness, ii. 387.

Schaum, H., on the elytra of *Dytiscus* and *Hydroporus*, i. 333.

Schelver, on dragon-flies, i. 352.

Schiodte, on the stridulation of *Heterocerus*, i. 368.

Schlegel, F. von, on the complexity of the languages of uncivilized peoples, i. 59.

Schlegel, Prof., on *Tanysiptera*, ii. 182.

Schleicher, Prof., on the origin of language, i. 54.

Schleiden, Prof., on the rattlesnake, ii. 28.

Schomburgk, Sir R., on the pugnacity of the male musk-duck of Guiana, ii. 40; on the courtship of *Rupicola crocea*, ii. 83.

Schoolcraft, Mr., on the difficulty of fashioning stone implements, i. 133.

Sclater, P. L., on modified secondary wing-feathers in the males of *Pipra*, ii. 62; on elongated feathers in night-jars, ii. 69; on the species of *Chasmorhynchus*, ii. 76; on the plumage of *Pelecanus onocrotatus*, ii. 82; on the plaintain-eaters, ii. 169; on the sexes and young of *Tadorna variegata*, ii. 197; on the colors of *Lemur macaco*, ii. 277; on the stripes in asses, ii. 291.

Scolecida, absence of secondary sexual characters in, i. 312.

Scolopax frenata, tail-feathers of, ii. 61.

Scolopax gallinago, drumming of, ii. 60.

Scolopax Javensis, tail-feathers of, ii. 61.

Scolopax major, assemblies of, ii. 97.

Scolopax Wilsonii, sound produced by, ii. 61.

Scolytus, stridulation of, i. 368.

Scoter-duck, black, sexual difference in coloration of the, ii. 216; bright beak of male, ii. 217.

Scott, J., on the color of the beard in man, ii. 304.

Scrope, on the pugnacity of the male salmon, ii. 3; on the battles of stags, ii. 229.

Scudder, S. H., imitation of the stridulation of the Orthoptera, i. 343; on the stridulation of the *Acridiidæ*, i. 346; on a Devonian insect, i. 349; on stridulation, ii. 315.

Sculpture, expression of the ideal of beauty by, ii. 333.

Sea-anemones, bright colors of, i. 313.

Sea-bear, polygamous, i. 260.

Sea-elephant, male, structure of the nose of the, ii. 264; polygamous, i. 260.

Sea-lion, polygamous, i. 260.

Seal, bladder-nose, ii. 265.

Seals, their sentinels generally females, i. 71; evidence furnished by, on classification, i. 183; sexual differences in the coloration of, ii. 273; appreciation of music by, ii. 317; battles of male, ii. 229; canine teeth of male, ii. 230; polygamous habits of, i. 260; pairing of, ii. 257; sexual peculiarities of, ii. 264.

Sea-scorpion, sexual differences in, ii. 9.

Season, changes of color in birds, in accordance with the, ii. 77; changes of plumage of birds in relation to, ii. 172.

Seasons, inheritance at corresponding, i. 273.

Sebituani, ii. 324.

Sebright Bantam, i. 285.

Secondary sexual characters, i. 245; relations of polygamy to, i. 257; gradation of, in birds, ii. 129; transmitted through both sexes, i. 270.

Sedgwick, W., on hereditary tendency to produce twins, i. 128.

Seemann, Dr., on the different appreciation of music by different peoples, ii. 318; on the effects of music, ii. 320.

Selasphorus platycercus, acuminate first primary of the male, ii. 62.

Selby, P. J., on the habits of the black and red grouse, i. 260.

Selection, double, i. 267.

Selection of male by female birds, ii. 95, 117.

Selection, methodical, of Prussian grenadiers, i. 108.

Selection, sexual, influence of, on the coloring of Lepidoptera, i. 390; explanation of, i. 248, 252, 262.

Selection, sexual and natural, contrasted, i. 270.

Self-command, habit of, inherited, i. 88; estimation of, i. 91.

Self-consciousness, i. 60.

Self-preservation, instinct of, i. 85.

Self-sacrifice, by savages, i. 84; estimation of, i. 91.

Semilunar fold, i. 23.

Semnopithecus, i. 189; long hair on the heads of species of, i. 184, ii. 363.

Semnopithecus chrysomelas, sexual differences of color in, ii. 277.
Semnopithecus comatus, ornamental hair on the head of, ii. 291.
Semnopithecus frontatus, beard, etc., of, ii. 294.
Semnopithecus nasica, nose of, i. 184.
Semnopithecus nemæus, coloring of, ii. 296.
Semnopithecus rubicundus, ornamental hair on the head of, ii. 291.
Senses, inferiority of Europeans to savages in the, i. 114.
Sentinels, i. 71, 79.
Serpents, instinctively dreaded by apes and monkeys, i. 36, 41.
Serranus, hermaphroditism in, i. 200.
Sex, inheritance limited by, i. 273.
Sexes, relative proportions of, in man, i. 291, ii. 305; probable relation of the, in primeval man, ii. 346.
Sexual characters, secondary, i. 245; relations of polygamy to, i. 259; transmitted through both sexes, i. 270; gradation of, in birds, ii. 129.
Sexual and natural selection, contrasted, i. 269.
Sexual characters, effects of the loss of, i. 275; limitation of, i. 275.
Sexual differences in man, i. 14.
Sexual selection, explanation of, i. 248, 252, 262; influence of, on the coloring of Lepidoptera, i. 390; action of, in mankind, ii. 352.
Sexual similarity, i. 268.
Sharks, prehensile organs of male, ii. 1.
Sharpe, R. B., on *Tanysiptera sylvia*, ii. 157; on *Ceryle*, ii. 165; on the young male of *Dacelo Gaudichaudi*, ii. 180.
Shaw, Mr., on the pugnacity of the male salmon, ii. 3.
Shaw, J., on the decorations of birds, ii. 68.
Sheep, danger-signals of, i. 74; sexual differences in the horns of, i. 274; horns of, i. 280; ii. 235, 247; domestic, sexual differences of, late developed, i. 283; numerical proportion of the sexes in, i. 295; mode of fighting of, ii. 238; arched foreheads of some, ii. 271.
Sheep, Merino, loss of horns in females of, i. 275; horns of, i. 280.
Shells, difference in form of, in male and female Gasteropoda, i. 315; beautiful colors and shapes of, i. 316.
Shield-drake, pairing with a common duck, ii. 109; New Zealand, sexes and young of, ii. 197.
Shooter, J., on the Kaffres, ii. 331; on the marriage-customs of the Kaffres, ii. 357.
Shrew-mice, odor of, ii. 265.
Shrike, Drongo, ii. 171.
Shrikes, characters of young, ii. 177.
Shuckard, W. E., on sexual differences in the wings of Hymenoptera, i. 334.
Shyness of adorned male birds, ii. 93.
Siagonium, proportions of the sexes in, i. 305; dimorphism in males of, i. 363.
Siam, proportion of male and female births in, i. 293.
Siamese, general beardlessness of the, ii. 306; notions of beauty of the, ii. 329; hairy family of, ii. 361.
Siebold, C. T., von, on the auditory apparatus of the stridulant orthoptera, i. 343.
Sight, inheritance of long and short, i. 114.
Signal-cries of monkeys, i. 55.
Silk-moth, difference of size of the male and female cocoons of the, i. 336; pairing of the, i. 388; male, fertilizing two or three females, i. 393; proportion of the sexes in, i. 300, 302; Ailantus, Prof. Canestrini, on the destruction of its larvæ by wasps, i. 302.
Simiadæ, i. 187; their origin and divisions, i. 204.
Similarity, sexual, i. 268.
Singing of the Cicadæ and Fulgoridæ, i. 351; of tree-frogs, ii. 25; of birds, object of the, ii. 50.
Sirenia, nakedness of, i. 142.
Sirex juvencus, i. 354.
Siricidæ, difference of the sexes in, i. 354.
Siskin, ii. 81; pairing with a canary, ii. 110.
Sitana, throat-pouch of the males of, ii 31, 35.
Size, relative, of the sexes of insects, i. 335.
Skin, movement of the, i. 19; nakedness of, in man, i. 142; color of the, i. 232.
Skin and hair, correlation of color of, i. 239.
Skull, variation of, in man, i. 104; cubic contents of, no absolute test of intellect, i. 140; Neanderthal, capacity of the, i. 140; causes of modification of the, i. 141; difference of, in form and capacity, in different races of men, i. 208; variability of the shape of the, i. 218; differences of, in the sexes in man, ii. 302; artificial modifications of the shape of, ii. 324.
Skunk, odor emitted by the, ii. 265.
Slavery, prevalence of, i. 90; of women, ii. 350.
Slaves, difference between those of field and house, i. 237.
Smell, sense of, in man and animals, i. 23.
Smith, Adam, on the basis of sympathy, i. 78.
Smith, Sir A., on the recognition of women by male *Cynocephali*, i. 13; on an instance of memory in a baboon, i. 43; on the retention of their color by the Dutch in South Africa, i. 233; on the polygamy of the South African antelopes, i. 258; on the proportion of the sexes in *Kobus ellipsiprymnus*, i. 296; on *Bucephalus capensis*, ii. 28; on South African lizards, ii. 35; on fighting gnus, ii. 229; on the horns of rhinoceroses, ii. 237; on the fighting of lions, ii. 254; on the colors of the Cape Eland, ii. 274; on the colors of the gnu, ii. 275; on Hottentot notions of beauty, ii. 329.
Smith, F., on the Cynipidæ and Tenthredi

nidæ, i. 305; on the relative size of the sexes of Aculeate Hymenoptera, i. 337; on the difference between the sexes of ants and bees, i. 354; on the stridulation of *Trox sabulosus*, i. 369; on the stridulation of *Mononychus pseudacori*, i. 371.
Smynthurus luteus, courtship of, i. 338.
Snakes, sexual differences of, ii. 28; male, ardency of, ii. 29.
"Snarling muscles," i. 122.
Snipe, drumming of the. ii. 60; coloration of the, ii. 216.
Snipe, painted, sexes and young of, ii. 193.
Snipe, solitary, assemblies of, ii. 97.
Snipes, arrival of male before the female, i. 251; pugnacity of male, ii. 41; double moult in, ii. 77.
Snow-goose, whiteness of the, ii. 218.
Social animals, affection of, for each other, i. 73; defence of, by the males, i. 79.
Sociability, the sense of duty connected with, i. 68; impulse to, in animals, i. 76, 77; manifestations of, in man, i. 81; instinct of, in animals, i. 82, 83.
Sociality, probable, of primeval men, i. 149; influence of, on the development of the intellectual faculties, i. 154; origin of, in man, i. 155.
Soldiers, American, measurements of, i. 108.
Soldiers and sailors, difference in the proportions of, i. 110.
Solenostoma, bright colors and marsupial sack of the females of, ii. 21.
Song of male birds appreciated by their females, i. 61; want of, in brilliant-plumaged birds, ii. 90; of birds, ii. 156.
Sorex, odor of, ii. 266.
Sounds admired alike by man and animals, i. 62; produced by fishes, ii. 22; produced by male frogs and toads, ii. 25; instrumentally produced by birds, ii. 61, *et seqq.*
Spain, decadence of, i. 171.
Sparassus smaragdulus, difference of color in the sexes of, i. 328.
Sparrow, pugnacity of the male, ii. 38; acquisition of the Linnet's song by a, ii. 52; coloration of the, ii. 189; immature plumage of the, ii. 180.
Sparrow, white-crowned, young of the, ii. 208.
Sparrows, house- and tree-, ii. 162.
Sparrows, new mates found by, ii. 101.
Sparrows, sexes and young of, ii. 203; learning to sing, ii. 319.
Spathura Underwoodi, ii. 74.
Spawning of fishes, ii. 15, 18.
Spear, origin of the, i. 225.
Species, causes of the advancement of, i. 165; distinctive characters of, i. 206; or races of man, i. 209; sterility and fertility of, when crossed, i. 214; supposed, of man, i. 218; gradation of, i. 218; difficulty of defining, i. 219; representative, of birds, ii. 182, 183; of birds, comparative differences between the sexes of distinct, ii. 184.
Spectre-insects, mimicry of leaves by, i. 401.
Spectrum femoratum, difference of color in the sexes of, i. 350.
Speech, connection between the brain and the faculty of, i. 56.
"Spel" of the black-cock, ii. 58.
Spencer, Herbert, on the dawn of intelligence, i. 36; on the origin of the belief in spiritual agencies, i. 63; on the origin of the moral sense, i. 97; on the influence of food on the size of the jaws, i. 113; on the ratio between individuation and genesis, i. 310; on music, ii. 320.
Sperm-whales, battles of male, ii. 229.
Sphingidæ, coloration of the, i. 383.
Sphinx, Humming-bird, i. 387.
Sphinx, Mr. Bates on the caterpillar of a, i. 402.
Spiders, i. 327; male, more active than female, i. 263; proportion of the sexes in, i 306; male, small size of, i. 328.
Spilosoma menthrasti, rejected by turkeys, i. 386.
Spine, alteration of, to suit the erect attitude of man, i. 138.
Spirits, fondness of monkeys for, i. 12.
Spiritual agencies, belief in, almost universal, i. 62.
Spoonbill, ii. 57; Chinese, change of plumage in, ii. 171.
Spots, retained throughout groups of birds, ii. 126; disappearance of, in adult mammals, ii. 288.
Sprengel, C. K., on the sexuality of plants, i. 252.
Spring-boc, horns of the, ii. 239.
Sproat, Mr., on the extinction of savages in Vancouver Island, i. 230; on the eradication of facial hair by the natives of Vancouver Island, ii. 332; on the eradication of the beard by the Indians of Vancouver Island, ii. 363.
Spurs, occurrence of, in female fowls, i. 271, 275; development of, in various species of Phasianidæ, i. 281; of Gallinaceous birds, ii. 41, 43; development of, in female Gallinaceæ, ii. 155.
Squilla, different colors of the sexes of a species of, i. 326.
Squirrels, battles of male, ii. 228; African, sexual differences in the coloring of, ii. 272; black, ii. 280.
Stag, long hairs of the throat of, ii. 256; horns of the, i. 270, 273; battles of, ii. 229; horns of the, with numerous branches, ii. 241; bellowing of the, ii. 261; crest of the, ii. 268.
Stag-beetle, large size of male, i. 336; weapons of the male, i. 364; numerical proportion of sexes of, i. 305.
Stainton, H. T., on the numerical proportion of the sexes in the smaller moths, i. 302; habits of *Elachista rufocinerea*, i 303; on the coloration of moths, i. 384. on the rejection of *Spilosoma menthra*

ti, by turkeys, i. 386; on the sexes of *Agrotis exclamationis*, i. 386.
Stallion, mane of the, ii. 256.
Stallions, two, attacking a third, i. 72; fighting, ii. 230; small canine teeth of, ii. 246.
Stansbury, Captain, observations on pelicans, i. 74.
Staphylinidæ, hornlike processes in male, i. 363.
Starfishes, bright colors of some, i. 313.
Stark, Dr., on the death-rate in towns and rural districts, i. 169; on the influence of marriage on mortality, i. 170; on the higher mortality of males in Scotland, i. 292.
Starling, American field, pugnacity of male, ii. 49.
Starling, red-winged, selection of a mate by the female, ii. 111.
Starlings, three, frequenting the same nest, i. 269, ii. 102; new mates found by, ii. 101.
Statues, Greek, Egyptian, Assyrian, etc., contrasted, ii. 333.
Stature, dependence of, upon local influences, i. 110.
Staudinger, Dr., his list of Lepidoptera, i. 304; on breeding Lepidoptera, i. 303.
Staunton, Sir G., hatred of indecency a modern virtue, i. 92.
Stealing of bright objects by birds, ii. 107.
Stebbing, T. R., on the nakedness of the human body, ii. 359.
Stemmatopus, ii. 265.
Stenobothrus pratorum, stridulating organs of, i. 346.
Sterility, general, of sole daughters, i. 164; when crossed, a distinctive character of species, i. 206.
Sterna, seasonal change of plumage in, ii. 218.
Stickle-back, polygamous, i. 262; male, courtship of the, ii. 2; male, brilliant coloring of, during the breeding-season, ii. 14; nidification of the, ii. 19.
Sticks used as implements and weapons by monkeys, i. 50.
Sting in bees, i. 246.
Stokes, Captain, on the habits of the great Bower-bird, ii. 66.
Stonechat, young of the, ii. 211.
Stone implements, difficulty of making, i. 133; as traces of extinct tribes, i. 228.
Stones, used by monkeys for breaking hard fruits and as missiles, i. 134; piles of, i. 224.
Stork, black, sexual differences in the bronchi of the, ii. 57; red beak of the, ii. 217.
Storks, ii. 216, 220; sexual difference in the color of the eyes of, ii. 123.
Strange, Mr., on the Satin Bower-bird, ii. 66.
Stretch, Mr., on the numerical proportion in the sexes of chickens, i. 296.
Strepsiceros kudu, horns of, ii. 243; markings of, ii. 287.
Stridulation, by males of *Theridion*, i. 329; of the Orthoptera and Homoptera discussed, i. 349; of beetles, i. 366.
Stripes, retained throughout groups of birds, ii. 125; disappearance of, in adult mammals, ii. 288.
Strix flammea, ii. 101.
Structure, existence of unserviceable modifications of, i. 147.
Struggle for existence, in man, i. 174, 178.
Struthers, Dr., on the occurrence of the supra-condyloid foramen in the humerus of man, i. 27.
Sturnella ludoviciana, pugnacity of the male, ii. 48.
Sturnus vulgaris, ii. 101.
Subspecies, i. 219.
Suffering, in strangers, indifference of savages to, i. 90.
Suicide, i. 166; formerly not regarded as a crime, i. 90; rarely practised among the lowest savages, i. 90.
Suidæ, stripes of young, ii. 176.
Sumatra, compression of the nose by the Malays of, ii. 335.
Sumner, Archbishop, man alone capable of progressive improvement, i. 47.
Sun-birds, nidification of, ii. 161.
Superstitions, i. 175; prevalence of, i. 95.
Superstitious customs, i. 66.
Superciliary ridge in man, ii. 301, 303.
Supernumerary digits, more frequent in men than in women, i. 268; inheritance of, i. 276; early development of, i. 282.
Supra-condyloid foramen in the early progenitors of man, i. 198.
Suspicion, prevalence of, among animals, i. 38.
Sulivan, Sir B. J., on two stallions attacking a third, ii. 230.
Swallow-tail Butterfly, i. 381.
Swallows deserting their young, i. 80, 87.
Swan, black, red beak of the, ii. 217; black-necked, ii. 220; white, young of, ii 202; wild, trachea of the, ii. 57.
Swans, ii. 216, 220; young, ii. 199.
Swaysland, Mr., on the arrival of migratory birds, i. 251.
Swinhoe, R., on the common rat in Formosa and China, i. 49; on the sounds produced by the male Hoopoe, ii. 60; on *Dicrurus macrocercus* and the Spoonbill, ii. 171; on the young of *Ardeola*, ii. 182; on the habits of *Turnix*, ii. 193; on the habits of *Rhynchæa Bengalensis*, ii. 193; on Orioles breeding in immature plumage, ii. 205, 206.
Sylvia atricapilla, young of, ii. 210.
Sylvia cinerea, aërial love-dance of the male, ii. 65.
Sympathy, i. 162; among animals, i. 74; its supposed basis, i. 78.
Sympathies, gradual widening of, i. 96.
Syngnathous fishes, abdominal pouch in male, i. 201.
Sypheotides auritus, acuminated primaries of the male, ii. 62; ear-tufts of, ii. 70.

T.

TABANIDÆ, habits of, i. 246.
Tadorna variegata, sexes and young of, ii. 197.
Tadorna vulpanser, ii. 109.
TAHITIANS, i. 176; compression of the nose by the, ii. 335.
TAIL, rudimentary, occurrence of, in man, i. 29; convoluted body in the extremity of the, i. 29; absence of, in man and the higher apes, i. 145, 187; variability of, in species of *Macacus* and in baboons, i. 144; presence of, in the early progenitors of man, i. 198; length of, in pheasants, ii. 149, 157, 158; difference of length of the, in the two sexes of birds, ii. 157.
TAIT, Lawson, on the effects of natural selection on civilized nations, i. 162.
TANAGER, scarlet, variation in the male, ii. 121.
Tanagra æstiva, ii. 172; age of mature plumage in, ii. 204.
Tanagra rubra, ii. 121; young of, ii. 210.
Tanais, absence of mouth in the males of some species of, i. 247; relations of the sexes in, i. 307; dimorphic males of a species of, i. 319.
TANKERVILLE, Earl, on the battles of wild-bulls, ii. 229.
Tanysiptera, races of, determined from adult males, ii. 182.
Tanysiptera sylvia, long tail-feathers of, ii. 157.
Taphroderes distortus, enlarged left mandible of the male, i. 334.
TAPIRS, longitudinal stripes of young, ii. 176, 288.
TARSI, dilatation of front, in male beetles, i. 333.
Tarsius, i. 192.
TASMANIA, half-castes killed by the natives of, i. 212.
TATTOOING, i. 224; universality of, ii. 323.
TASTE, in the Quadrumana, ii. 282.
TAYLOR, G., on *Quiscalus major*, i. 298.
TEA, fondness of monkeys for, i. 12.
TEAR-SACS, of Ruminants, ii. 267.
TEEBAY, Mr., on changes of plumage in spangled Hamburg fowls, i. 272.
TEETH, rudimentary incisor, in Ruminants, i. 17; posterior molar, in man, i. 25; wisdom, i. 26; diversity of, i. 104; canine, in the early progenitors of man, i. 198; canine, of male mammals, ii. 230; in man, reduced by correlation, ii. 310; staining of the, ii. 323; front, knocked out or filed by some savages, ii. 324.
TEGETMEIER, Mr., on the abundance of male pigeons, i. 296; on the wattles of game-cocks, ii. 94; on the courtship of fowls, ii. 112; on dyed pigeons, ii. 113.
TEMBETA, ii. 325.
TEMPER, in dogs and horses, inherited, i. 88.
TENCH, proportions of the sexes in the, i. 299, 300; brightness of male, during breeding-season, ii. 18
TENEBRIONIDÆ, stridulation of, i. 367.
TENNENT, Sir J. E., on the tusks of the Ceylon Elephant, ii. 237, 247; on the frequent absence of beard in the natives of Ceylon, ii. 306; on the Chinese opinion of the aspect of the Cingalese, ii. 328.
TENNYSON, A., on the control of thought, i. 91.
TENTHREDINIDÆ, proportions of the sexes in, i. 305; fighting habits of male, i. 353; difference of the sexes in, i. 354.
Tephrodornis, young of, ii. 182.
TERAI, i. 229.
Termites, habits of, i. 353.
TERNS, white, ii. 218; and black, ii. 220.
TERNS, seasonal change of plumage in, ii. 218
TERROR, common action of, upon the lower animals and man, i. 38.
Testudo nigra, ii. 27.
Tetrao cupido, battles of, ii. 48; sexual difference in the vocal organs of, ii. 53.
Tetrao phasianellus, dances of, ii. 65; duration of dances of, ii. 96.
Tetrao Scoticus, ii. 163, 177, 186.
Tetrao tetrix, ii. 163, 177, 186; pugnacity of the male, ii. 42.
Tetrao umbellus, pairing of, ii. 46; battles of, ii. 48; drumming of the male, ii. 59.
Tetrao urogalloides, dances of, ii. 96.
Tetrao urogallus, pugnacity of the male, ii. 42.
Tetrao urophasianus, inflation of the œsophagus in the male, ii. 55.
Thamnobia, young of, ii. 182.
Thaumalea picta, display of plumage by the male, ii. 85.
Thecla, sexual differences of coloring in species of, i. 377.
Thecla rubi, protective coloring of, i. 380.
Theridion, i. 329; stridulation of males of, i. 331.
Theridion lineatum, variability of, i. 328.
Thomisus citreus, and *T. floricolens*, difference of color in the sexes of, i. 328.
THOMPSON, J. H., on the battles of sperm-whales, ii. 230.
THOMPSON, W., on the coloring of the male char during the breeding-season, ii. 14; on the pugnacity of the males of *Gallinula chloropus*, ii. 39; on the finding of new mates by magpies, ii. 99; on the finding of new mates by Peregrine falcons, ii. 100.
THORAX, processes of, in male beetles, i. 357.
THORELL, T., on the proportion of the sexes in spiders, i. 306.
THORNBACK, difference in the teeth of the two sexes of the, ii. 6.
THOUGHTS, control of, i. 97.
THRUSH, pairing with a blackbird, ii. 109; colors and nidification of the, ii. 162.
THRUSHES, characters of young, ii. 177, 257.
THUG, his regrets, i. 91.
THUMB, absence of, in *Ateles* and *Hylobates*, i. 135.

Thury, M., on the numerical proportion of male and female births among the Jews, i. 292.
Thylacinus, possession of the marsupial sac by the male, i. 199.
Thysanura, i. 338.
Tibia, dilated, of the male *Crabro cribrarius*, i. 333.
Tibia and femur, proportions of, in the Aymara Indians, i. 115.
Tierra del Fuego, marriage-customs of, ii. 356.
Tiger, colors and markings of the, ii. 287.
Tigers, depopulation of districts by, in India, i. 129.
Tillus elongatus, difference of color in the sexes of, i. 357.
Timidity, variability of, in the same species, i. 39.
Tineina, proportion of the sexes in, i. 301.
Tipula, pugnacity of male, i. 339.
Tits, sexual difference of color in, ii. 166.
Toads, ii. 24; male, treatment of ova by some, i. 202; male, ready to breed before the female, i. 252.
Toe, great, condition of, in the human embryo, i. 17.
Tomtit, blue, sexual difference of color in the, ii. 166.
Tonga Islands, beardlessness of the natives of, ii. 307, 333.
Tooke, Horne, on language, i. 53.
Tools, flint, i. 176; used by monkeys, i. 49; use of, i. 132.
Topknots, in birds, ii. 71.
Tomicus villosus, proportion of the sexes in, i. 305.
Tortoise, voice of the male, ii. 316.
Tortures, submitted to by American savages, i. 91.
Totanus, double moult in, ii. 77.
Toucans, colors and nidification of the, ii. 163; beaks and ceres of the, ii. 217.
Towns, residence in, a cause of diminished stature, i. 111.
Toynbee, J., on the external shell of the ear in man, i. 21.
Trachea, convoluted and embedded in the sternum, in some birds, ii. 57; structure of the, in *Rhynchæa*, ii. 193.
Trades, affecting the form of the skull, i. 141.
Tragelaphus, sexual differences of color in, ii. 274.
Tragelaphus scriptus, dorsal crest of, ii. 268; markings of, ii. 286, 287.
Tragopan, i. 261; swelling of the wattles of the male, during courtship, ii. 68; display of plumage by the male, ii. 87; markings of the sexes of the, ii. 128.
Tragops dispar, sexual difference in the color of, ii. 28.
Training, effect of, on the mental difference between the sexes of man, ii. 313.
Transfer of male characters to female birds, ii. 185.
Transmission, equal, of ornamental characters, to both sexes in mammals, ii. 283.
Traps, avoidance of, by animals, i. 48; use of, i. 132.
Treachery, to comrades, avoidance of, by savages, i. 84.
Tremex columbæ, i. 354.
Tribes, extinct, i. 154; extinction of, i. 226.
Trichius, difference of color in the sexes of a species of, i. 356.
Trimen, R., on the proportion of the sexes in South African butterflies, i. 301; on the attraction of males by the female of *Lasiocampa quercus*, i. 303; on *Pneumora*, i. 348; on difference of color in the sexes of beetles, i. 356; on moths brilliantly colored beneath, i. 384; on mimicry in butterflies, i. 398; on *Gynanisa Isis*, and on the ocellated spots of Lepidoptera, ii. 127; on *Cyllo Leda*, ii. 128.
Tringa, sexes and young of, ii. 207.
Tringa cornuta, ii. 78.
Triphæna, coloration of the species of, i. 382.
Tristram, H. B., on unhealthy districts in North Africa, i. 235; on the habits of the chaffinch in Palestine, i. 298; on the birds of the Sahara, ii. 164; on the animals inhabiting the Sahara, ii. 214.
Triton cristatus, ii. 23.
Triton palmipes, ii. 23.
Triton punctatus, ii. 23.
Troglodytes vulgaris, ii. 189.
Trogons, colors and nidification of the, ii. 163, 165.
Tropic-birds, white only when mature, ii. 218.
Tropics, fresh-water fishes of the, ii. 17.
Trout, proportion of the sexes in, i. 299; male, pugnacity of the, ii. 3.
Trox sabulosus, stridulation of, i. 369.
Truth, not rare between members of the same tribe, i. 91; more highly appreciated by certain tribes, i. 96.
Tulloch, Major, on the immunity of the negro from certain fevers, i. 234.
Tumbler, almond, change of plumage in the, i. 284.
Turdus merula, ii. 162; young of, ii. 210.
Turdus migratorius, ii. 177.
Turdus musicus, ii. 162.
Turdus polyglottus, young of, ii. 210.
Turdus torquatus, ii. 162.
Turkey, swelling of the wattles of the male, ii. 68; variety of, with a topknot, ii. 71; recognition of a dog by a, ii. 106; wild, pugnacity of young male, ii. 46; wild, notes of the, ii. 58; male, wild, acceptable to domesticated females, ii. 114; wild, first advances made by older females, ii. 116; wild, breast-tuft of bristles of the, ii. 171.
Turkey-cock, scraping of the wings of, upon the ground, ii. 59; wild, display of plumage by, ii. 83; fighting habits of, ii. 94.
Turner, Prof. W., on muscular fasciculi in man referable to the panniculus carnosus, i. 19; on the occurrence of the su-

pracondyloid foramen in the human humerus, i. 27; on muscles attached to the coccyx in man, i. 29; on the *filum terminale* in man, i. 29; on the variability of the muscles, i. 105; on abnormal conditions of the human uterus, i. 119; on the development of the mammary glands, i. 201; on male fishes hatching ova in their mouths, i. 202.
Turnix, sexes of some species of, ii. 192, 198.
TURTLE-DOVE, cooing of the, ii. 58.
TUTTLE, H., on the number of species of man, i. 218.
TYLOR, E. B., on emotional cries, gestures, etc., of man, i. 52; on the origin of the belief in spiritual agencies, i. 64; on the primitive barbarism of civilized nations, i. 174; on the origin of counting, i. 174; on resemblances of the mental characters in different races of man, i. 223.
TYPE of structure, prevalence of, i. 203.
Typhœus, stridulating organs of, i. 366; stridulation of, i. 369.
TWINS, tendency to produce, hereditary, i. 128.
TWITE, proportion of the sexes in the, i. 297.

U.

UGLINESS, said to consist in an approach to the lower animals, ii. 337.
UMBRELLA-BIRD, ii. 55, 56.
Umbrina, sounds produced by, ii. 22.
UNITED States, rate of increase in, i. 126; influence of natural selection on the progress of, i. 172; change undergone by Europeans in the, i. 237.
Upupa epops, sounds produced by the male, ii. 60.
URANIIDÆ, coloration of the, i. 183.
Uria troile, variety of (= *U. lacrymans*), ii. 122.
URODELA, ii. 22.
Urosticte Benjamini, sexual differences in, ii. 145.
USE and disuse of parts, effects of, i. 112; influence of, on the races of man, i. 238.
UTERUS, reversion in the, i. 118; more or less divided, in the human subject, i. 118, 125; double, in the early progenitors of man, i. 198.

V.

VACCINATION, influence of, i. 162.
VANCOUVER Island, Mr. Sproat on the savages of, i. 230; natives of, eradication of facial hair by the, ii. 331.
Vanellus cristatus, wing-tubercles of the male, ii. 44.
Vanessæ, i. 375; resemblance of lower surface of, to bark of trees, i. 380.
VARIABILITY, causes of, i. 107; in man, analogous to that in the lower animals, i. 108; of the races of man, i. 217; greater in men than in women, i. 267; period of, relation of the, to sexual selection, i. 287; of birds, ii. 119; of secondary sexual characters in man, ii. 305.
VARIATION, correlated, i. 29; laws of, i 109; in man, i. 178; analogous, i. 186; analogous, in plumage of birds, ii. 71.
VARIATIONS, spontaneous, i. 126.
VARIETIES, absence of, between two species, evidence of their distinctness, i. 207.
VARIETY, an object in nature, ii. 220.
VARIOLA, communicable between man and the lower animals, i. 11.
VAURÉAL, i. 28.
VEDDAHS, monogamous habits of, ii. 347.
VEITCH, Mr., on the aversion of Japanese ladies to whiskers, ii. 332.
VENGEANCE, instinct of, i. 85.
VENUS Erycina, priestesses of, ii. 341.
VERMES, i. 318.
VERMIFORM appendage, i. 26.
VERREAUX, M., on the attraction of numerous males by the female of an Australian *Bombyx*, i. 303.
VERTEBRÆ, caudal, number of, in macaques and baboons, i. 144; of monkeys, partly embedded in the body, i. 145.
VERTEBRATA, ii. 1; common origin of the, i. 195; most ancient progenitors of, i. 203; origin of the voice in air-breathing, ii. 315.
Vesicula prostatica, the homologue of the uterus, i. 30, 199.
VIBRISSÆ, represented by long hairs in the eyebrows, i. 24.
Vidua, ii. 173.
Vidua axillaris, i. 260.
VILLERME, M., on the influence of plenty upon stature, i. 110.
VINSON, Aug., on the male of *Epeira nigra*, i. 329.
VIPER, difference of the sexes in the, ii. 28.
VIREY, on the number of species of man, i. 218.
VIRTUES, originally social only, i. 90; gradual appreciation of, i. 159.
VISCERA, variability of, in man, i. 105.
VITI Archipelago, population of the, i. 217.
VLACOVICH, Prof., on the ischio-pubic muscle, i. 122.
VOCAL music of birds, ii. 48.
VOCAL organs of man, i. 56; of birds, i. 57; ii. 156; of frogs, ii. 27; of the Insessores, ii. 53; difference of, in the sexes of birds, ii. 53; primarily used in relation to the propagation of the species, ii. 314.
VOGT, Carl, on the origin of species, i. 1; on the origin of man, i. 4; on the semilunar fold in man, i. 23; on the imitative faculties of microcephalous idiots, i. 55; on microcephalous idiots, i. 116; on skulls from Brazilian caves, i. 210; on the evolution of the races of man, i. 221; on the formation of the skull in women, ii. 302; on the Ainos and negroes, ii. 306; on the increased cranial difference of the sexes in man with race-development, ii. 314; on the obliquity of the eye in the Chinese and Japanese, ii. 328.

Voice in mammals, ii. 261; in monkeys and man, ii. 304; in man, ii. 319; origin of, in air-breathing vertebrates, ii. 315.

Von Baer, definition of advancement in the organic scale, i. 203.

Vulpian, Prof., on the resemblance between the brains of man and of the higher apes, i. 11.

Vultures, selection of a mate by the female, ii. 111; colors of, ii. 219.

W.

Waders, young of, ii. 208.

Wagner, R., on the occurrence of the diastema in a Kaffre skull, i. 122; on the bronchi of the black stork, ii. 57.

Wagtail, Ray's, arrival of the male before the female, i, 251.

Wagtails, Indian, young of, ii. 182.

Waist, proportions of, in soldiers and sailors, i. 112.

Waitz, Prof., on the number of species of man, i. 218; on the color of Australian infants, ii. 303; on the beardlessness of negroes, ii. 306; on the fondness of mankind for ornaments, ii. 322; on the liability of negroes to tropical fevers after residence in a cold climate, i, 234; on negro ideas of female beauty, ii. 330; on Javanese and Cochin-Chinese ideas of beauty, ii. 331.

Walckenaer and Gervais, on the Myriapoda, i. 330.

Waldeyer, M., on the hermaphroditism of the vertebrate embryo, i. 199.

Wales, North, numerical proportion of male and female births in, i. 291.

Walker, Alex., on the large size of the hands of laborers' children, i. 113.

Walker, F., on sexual differences in the diptera, i. 338.

Wallace, Dr. A., on the prehensile use of the tarsi in male moths, i. 248; on the rearing of the Ailantus silk-moth, i. 302; on breeding Lepidoptera, i. 302; proportion of sexes of *Bombyx Cynthia*, *B. yamamai*, and *B. Pernyi*, reared by, i. 304; on the development of *Bombyx Cynthia* and *B. yamamai*, i. 336; on the pairing of *Bombyx Cynthia*, i. 388; on the fertilization of moths, 393.

Wallace, A. R., on the origin of man, i. 4; on the power of imitation in man, i. 38; on the use of missiles by the orang, i. 50; on the varying appreciation of truth among different tribes, i. 96; on the limits of natural selection in man, i. 132, 152; on the occurrence of remorse among savages, i. 159; on the effects of natural selection on civilized nations, i. 161; on the use of the convergence of the hair at the elbow in the orang, i. 185; on the contrast in the characters of the Malays and Papuans, i. 208; on the line of separation between the Papuans and Malays, i. 210; on the sexes of *Ornithoptera Crœsus*, i. 301; on protective resemblances, i. 313; on the relative sizes of the sexes of insects, i. 336; on *Elaphomyia*, i. 338; on the Birds of Paradise, i. 260; on the pugnacity of the males of *Leptorhynchus angustatus*, i. 363; on sounds produced by *Euchirus longimanus*, i. 370; on the colors of *Diadema*, i. 376; on *Kallima*, i. 380; on the protective coloring of moths, i. 382; on bright coloration as protective in butterflies, i. 383; on variability in the Papilionidæ, i. 389; on male and female butterflies inhabiting different stations, i. 391; on the protective nature of the dull coloring of female butterflies, i. 392, 392, 401; on mimicry in butterflies, i. 398; on the mimicry of leaves by Phasmidæ, i. 401; on the bright colors of caterpillars, i. 403; on brightly-colored fishes frequenting reefs, ii. 17; on the coral snakes, ii. 30; on *Paradisea apoda*, ii. 70, 74; on the display of plumage by male Birds of Paradise, ii. 85; on assemblies of Birds of Paradise, ii. 97; on the instability of the ocellated spots in *Hipparchia Janira*, ii. 127; on sexually-limited inheritance, ii. 148; on the sexual coloration of birds, ii. 158, 187, 189, 192, 198; on the relation between the colors and nidification of birds, ii. 158, 163; on the coloration of the Cotingidæ, ii. 169; on the females of *Paradisea apoda* and *Papuana*, ii. 184; on the incubation of the Cassowary, ii. 195; on protective coloration in birds, ii. 213; on the hair of the Papuans, ii. 329; on the Babirusa, ii, 250; on the markings of the tiger, ii. 287; on the beards of the Papuans, ii. 306; on the distribution of hair on the human body, ii. 259.

Walrus, development of the nictitating membrane in the, i. 23; tusks of the, ii. 231, 237; use of the tusks by the, ii. 246.

Walsh, B. D., on the proportion of the sexes in *Papilio turnus*, i. 301; on the Cynipidæ and Cecidomyidæ, i. 305; on the jaws of *Ammophila*, i. 332; on *Corydalis cornutus*, i. 332; on the prehensile organs of male insects, i. 333; on the antennæ of *Penthe*, i. 333; on the caudal appendages of dragon-flies, i. 334; on *Platyphyllum concavum*, i. 345; on the sexes of the Ephemeridæ, i. 350; on the difference of color in the sexes of *Spectrum femoratum*, i. 350; on sexes of dragon-flies, i. 350; on the difference of the sexes in the Ichneumonidæ, i. 354; on the sexes of *Orsodacna atra*, i. 357; on the variation of the horns of the male *Phanæus carnifex*, i. 359; on the coloration of the species of *Anthocharis*, i. 381.

Wapiti, battles of, ii. 229; traces of horns in the female, ii. 234; attacking a man, ii. 241; crest of the male, ii. 268; sexual difference in the color of the, ii. 276.

Warbler, Hedge, ii. 189; young of the, ii. 200.

Warblers, Superb, nidification of, ii. 161.

Wariness, acquired by animals, i. 48.

Warington, R., on the habits of the sticklebacks, ii. 2, 20; on the brilliant colors of the male stickleback during the breeding-season, ii. 14.

Wart-hog. tusks and pads of the, ii. 253.

Watchmakers, short-sighted, i. 113.

Waterhen, ii. 38.

Waterhouse, C. O., on blind beetles, i. 356; on difference of color in the sexes of beetles, i. 356.

Waterhouse, G. R., on the voice of *Hylobates agilis*, ii. 316.

Water-ouzel, autumn song of the, ii. 51.

Waterton, C., on the pairing of a Canada goose with a Bernicle gander, ii. 109; on hares fighting, ii. 228; on the Bell-bird, ii. 75.

Wattles, disadvantageous to male birds in fighting, ii. 94.

Wealth, influence of, i. 163.

Weale, J. Mansel, on a South African caterpillar, i. 403.

Weapons, employed by monkeys, i. 50; use of, i. 132; offensive, of males, i. 249; of mammals, ii. 230, *et seq.*

Weaver-bird, ii. 52.

Weaver-birds, rattling of the wings of, ii. 59; assemblies of, ii. 97.

Webb, Dr., on the wisdom teeth, i. 26.

Wedgewood, Hensleigh, on the origin of language, i. 54.

Weevils, sexual difference in length of snout in some, i. 247.

Weir, Harrison, on the numerical proportion of the sexes in pigs and rabbits, i. 295; on the sexes of young pigeons, i. 297; on the songs of birds, ii. 50; on pigeons, ii. 104; on the dislike of blue pigeons to other colored varieties, ii. 113; on the desertion of their mates by female pigeons, ii. 114.

Weir, J. Jenner, on the nightingale and blackcap, i. 257; on the relative sexual maturity of male birds, i. 253; on female pigeons deserting a feeble mate, i. 254; on three starlings frequenting the same nest, i. 260; on the proportion of the sexes in *Machetes pugnax* and other birds, i. 297; on the coloration of the *Triphœnæ*, i. 383; on the rejection of certain caterpillars by birds, i. 403; on sexual differences of the beak in the goldfinch, ii. 38; on a piping bullfinch, ii. 50; on the object of the nightingale's song, ii. 49; on song-birds, ii. 51; on the pugnacity of male fine-plumaged birds, ii. 89; on the courtship of birds, ii. 90; on the finding of new mates by Peregrine-falcons and Kestrels, ii. 100; on the bullfinch and starling. ii. 101; on the cause of birds remaining unpaired, ii. 103; on starlings and parrots living in triplets, ii. 103; on recognition of color by birds, ii. 106; on hybrid birds, ii. 109; on the selection of a greenfinch by a female canary, ii. 110; on a case of rivalry of female bullfinches, ii. 116; on the maturity of the Golden-pheasant, ii. 204.

Weisbach, Dr., measurement of men of different races, i. 208; on the greater variability of men than of women, i. 266; on the relative proportions of the body in the sexes of different races of man, ii. 305.

Welcker, M., on Brachycephaly and Dolichocephaly, i. 142; on sexual differences in the skull in man, ii. 302.

Wells, Dr., on the immunity of colored races from certain poisons, i. 234.

Westring, on the stridulation of *Reduvius personatus*, i. 340; on the stridulating organs of the Coleoptera, i. 370; on sounds produced by *Cychrus*, i. 370; on the stridulation of males of *Theridion*, i. 330; on the stridulation of beetles, i. 367; on the stridulation of *Omaloplia brunnea*, i. 369.

Westphalia, greater proportion of female illegitimate children in, i. 292.

Westrop, H. M., on the prevalence of certain forms of ornamentation, i. 224.

Westwood, J. O., on the classification of the Hymenoptera, i. 181; on the Culicidæ and Tabanidæ, i. 246; on a Hymenopterous parasite with a sedentary male, i. 263; on the proportions of the sexes in *Lucanus cervus* and *Siagonium*, i. 305; on the absence of ocelli in female mutillidæ, i. 331; on the jaws of *Ammophila*, i. 332; on the copulation of insects of distinct species, i. 332; on the male of *Crabro cribrarius*, i. 333; on the pugnacity of male *Tipulæ*, i. 339; on the stridulation of *Pirates stridulus*, i. 340; on the Cicadæ, i. 341; on the stridulating organs of the crickets, i. 335; on *Pneumora*, i. 347; on *Ephippiger vitium*, i. 345, 348; on the pugnacity of the Mantides, i. 349; on *Platyblemnus*, i. 350; on difference in the sexes of the Agrionidæ, i. 351; on the pugnacity of the males of a species of Tenthredinæ, i. 352; on the pugnacity of the male stag-beetle, i. 364; on *Bledius taurus* and *Siagonium*, i. 363; on lamellicorn beetles, i. 364; on the coloration of *Lithosia*, i. 383.

Whale, Sperm-, battles of male, ii. 229.

Whales, nakedness of, i. 142.

Whately, Archb., language not peculiar to man, i. 52; on the primitive civilization of man, i. 174.

Whewell, Prof., on maternal affection, i. 38.

Whiskers, in monkeys, i. 185.

White, Gilbert, on the proportion of the sexes in the partridge, i. 297; on the house-cricket, i. 342; on the object of the song of birds, ii. 50; on the finding of new mates by white owls, ii. 101; on spring coveys of male partridges, ii. 103.

Whiteness, a sexual ornament in some birds, ii. 221; of mammals inhabiting snowy countries, ii. 284.

White-throat, aërial love-dance of the male, ii. 65.

Widow-bird, polygamous, i. 260; breed

ing plumage of the male, ii. 80, 93; female, rejecting the unadorned male, ii. 115.
Widows and widowers, mortality of, i. 170.
Wigeon, pairing with a pintail duck, ii. 109.
Wilckens, Dr., on the modification of domestic animals in mountainous regions, i. 116; on a numerical relation between the hairs and excretory pores in sheep, i. 239.
Wilder, Dr. Burt, on the greater frequency of supernumerary digits in men than in women, i. 267.
Williams, on the marriage-customs of the Fijians, ii. 357.
Wilson, Dr., on the conical heads of the natives of Northwestern America, ii. 335; on the Fijians, ii. 335; on the persistence of the fashion of compressing the skull, ii. 336.
Wing-spurs, ii. 155.
Wings, differences of, in the two sexes of butterflies and Hymenoptera, i. 335; play of, in the courtship of birds, ii. 91.
Winter, change of color of mammals in, ii. 284.
Witchcraft, i. 66.
Wives, traces of the forcible capture of, i. 175.
Wolf, winter change of the, ii. 284.
Wolff, on the variability of the viscera in man, i. 105.
Wollaston, T. V., on *Eurygnathus*, i. 334; on musical curculionidæ, i. 366; on the stridulation of *Acalles*, i. 372.
Wolves learning to bark from dogs, i. 42; hunting in packs, i. 72.
Wolves, black, ii. 280.
Wombat, black varieties of the, ii. 280.
Women distinguished from men by male monkeys, i. 13; preponderance of, in numbers, i. 292; effects of selection of, in accordance with different standards of beauty, ii. 339; practice of capturing, ii. 344, 348; early betrothals and slavery of, ii. 350; selection of, for beauty, ii. 356; freedom of selection by, in savage tribes, ii. 356.
Wonder, manifestations of, by animals, i. 41.
Wonfor, Mr., on sexual peculiarities in the wings of butterflies, i. 335.
Woolner, Mr., observations on the ear in man, i. 22.
Wood, J., on muscular variations in man, i. 105, 123, 124; on the greater variability of the muscles in men than in women, i. 266.
Wood, T. W., on the coloring of the orange-tip butterfly, i. 381; on the habits of the Saturniidæ, i. 385; on the habits of *Menura Alberti*, ii. 53; on *Tetrao cupido*, ii. 53; on the display of plumage by male pheasants, ii. 85; on the ocellated spots of the Argus pheasant, ii. 138; on the habits of the female Cassowary, ii. 195.
Woodcock, coloration of the, ii. 216.
Woodpecker, selection of a mate by the female, ii. 111.
Woodpeckers, ii. 53; tapping of, ii. 59; colors and nidification of the, ii. 163, 166, 214; characters of young, ii. 177, 190. 200.
Wormald, Mr., on the coloration of *Hypopyra*, i. 384.
Wounds, healing of, i. 13.
Wren, ii. 189; young of the, ii. 200.
Wright, C. A., on the young of *Orocetes* and *Petrocincla*, ii. 210.
Wright, Chauncey, on correlative acquisition, ii. 319; on the enlargement of the brain in man, ii. 373.
Wright, Mr., on the Scotch deerhound. ii. 250; on sexual preference in dogs, ii. 259; on the rejection of a horse by a mare, ii. 260.
Wright, W. von, on the protective plumage of the Ptarmigan, ii. 78.
Writing, i. 175.
Wyman, Prof., on the prolongation of the coccyx in the human embryo, i. 16; on the condition of the great-toe in the human embryo, i. 17; on variation in the skulls of the natives of the Sandwich Islands, i. 104; on the hatching of the eggs in the mouths and branchial cavities of male fishes, i. 202; ii. 19.

X.

Xenarchus, on the Cicadæ, i. 340.
Xenorhynchus, sexual difference in the color of the eyes in, ii. 123.
Xiphophorus Hellerii, peculiar anal fin of the male, ii. 9, 10.
Xylocopa, difference of the sexes in, i. 354.

Y.

Yarrell, W., on the habits of the Cyprinidæ, i. 300; on *Raia clavata*, ii. 2; on the characters of the male salmon during the breeding-season, ii. 4, 14; on the characters of the rays, ii. 6; on the gemmeous dragonet, ii. 8; on the spawning of the salmon, ii. 18; on the incubation of the Lophobranchii, ii. 20; on rivalry in song-birds, ii. 50; on the trachea of the swan, ii. 57; on the moulting of the anatidæ, ii. 81; on an instance of reasoning in a gull, ii. 104; on the young of the waders, ii. 208.
Yellow fever, immunity of negroes and mulattoes from, i. 234.
Youatt, Mr., on the development of the horns in cattle, i. 280.
Yura-caras, their notions of beauty, ii. 331.

Z.

Zebra, rejection of an ass by a female, ii. 281; stripes of the, ii. 288.
Zebus, humps of, ii. 271.
Zigzags, prevalence of, as ornaments, i. 224.
Zincke, Mr., on European emigration to America, i. 172.
Zootoca vivipara, sexual difference in the color of, ii. 34.
Zygænidæ, coloration of the, i. 383.

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